23 JUNE 1955 ONE SHILLING

ELECTRICAL TIMES

In New Flats . . .

Grosvenor Street Flats, Portsmouth.
City Architect: Mr. Frank Mellor, F.R.I.B.A.
Electrical Contractor: Mr. R. Brock, Gosport.
BICC cables were used exclusively.

. . . or Converted Houses

Bitterne Manor, Southampton.
Architect: Mr. H. Collins, F.R.I.B.A., M.T.P.I.
Electrical Contractors:
Messrs. R. F. Webb, Ltd. Southampton.
BICC cables were used exclusively.

Rubber Insulated Cables to B.S.7

P.V.C. Insulated Cables to B.S.2004

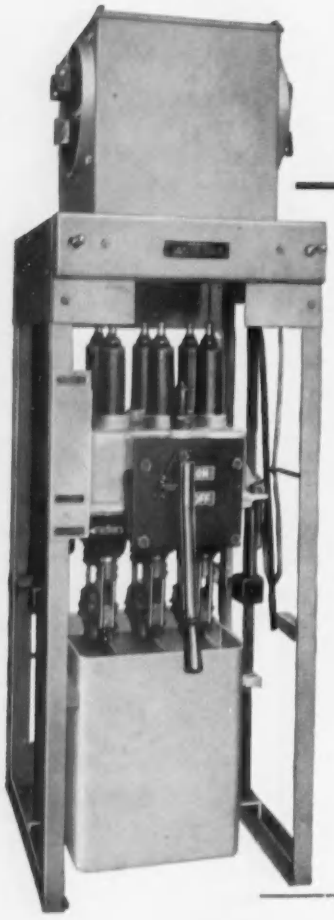
Polythene Insulated and P.V.C. Sheathed Cables to B.S.1557

BICC WIRING CABLES

BRITISH INSULATED CALLENDER'S CABLES LIMITED, 21 BLOOMSBURY STREET, LONDON, W.C.1

BI Callender's

B.E.P.C. EXHIBITION



ONE of the

EXHIBITS ON STAND 47

The Trinal Oil Switch, illustrated on the left, is but one of the interesting switchgear units to be seen on the J. & P. stand.

In addition, we are introducing a new design of oil-switch for ring main units which has recently been short-circuit tested to 250 MVA at 11 kV, and also a metalclad vertical isolation circuit-breaker rated at 500 MVA and 350 MVA at 11 kV and 350 MVA at 6·6 kV.

THE TRINAL OIL-SWITCH

TYPE TOS

★ Complete isolation with no interruption of supply in ring main units.

★ Suitable for systems up to 250 MVA at 6·6 kV.

★ Electro-magnetic forces assist closure of the switch.

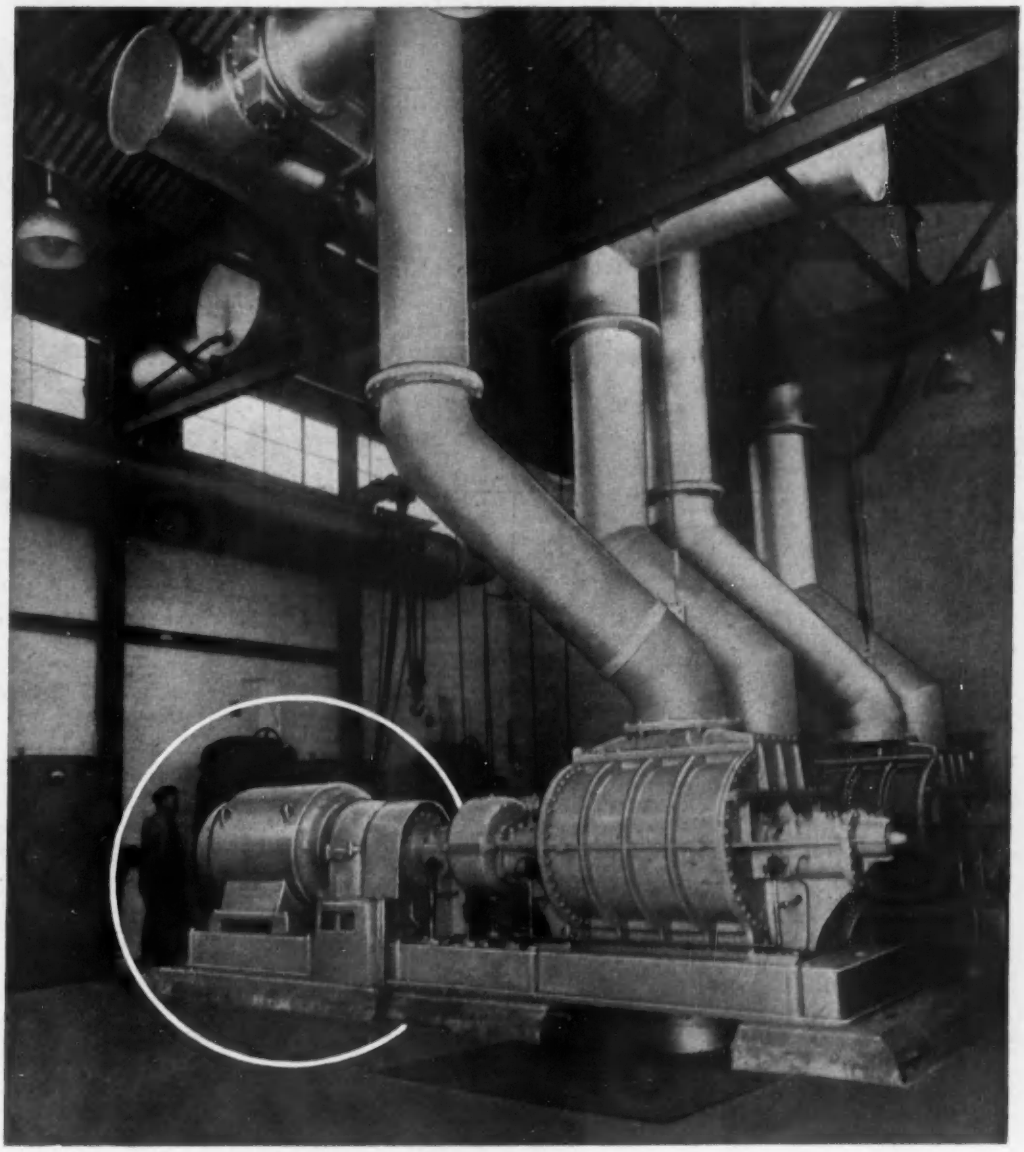
★ Liberal clearances with small dimensions.

A FULL RANGE OF DOMESTIC APPLIANCES CAN BE SEEN ON STAND No. 46

JOHNSON & PHILLIPS LTD.

CHARLTON · LONDON · S.E.7

ELECTRICAL ENGINEERS AND CABLE MAKERS. EST. 1875



Two 230/70 h.p. N-S variable speed a.c. motors driving blowers in an Australian fertilizer factory

L.S.E. motors are in service in the most productive circles

The stepless speed range of the N-S variable speed a.c. motor, in conjunction with its adaptability for use with almost any form of automatic control, is helping to increase the efficiency of a multitude of machines and processes

LAURENCE, SCOTT & ELECTROMOTORS LTD.

NORWICH, MANCHESTER, LONDON & BRANCHES

Renowned for

Reliability

Electrolux *Silent* Refrigerators

are renowned for reliability. The original refrigerator without machinery, it has all the improvements and refinements evolved during 30 years of experience and constant research. 4 models: 1½ to 7 cu. ft. *Cooling Unit guaranteed 5 years.*

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Quietly . . . gently . . . it extracts all the dust, not merely from carpets but from all the furnishings, too. Tools for floor-to-ceiling cleaning (without extra cost) make Electrolux more than a carpet cleaner. 2 *Year Guarantee.*

Electrolux *Quiet* Floor Polisher

excels in speedy, effortless polishing of parquet, marble, tiled, lino and other flooring—*quietly*, without disturbance. Triangular body gets right into corners. Triple-brush-action—originated by Electrolux 25 years ago — ensures effortless control. 2 *Year Guarantee.*

Electrolux *Excels*...

By Appointment Refrigerator Makers to the late King George VI

By Appointment Suction Cleaner and Refrigerator Manufacturers to the late Queen Mary

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THERE'S *nothing* LIKE CHEMICO

The SAFE, certain cleaner for all electric cookers

Chemico shifts grease and dirt like lightning and with so little effort too. And Chemico is so safe and gentle — it won't scratch glossy paint surfaces or harm your hands. Chemico comes in 1 lb. and 2 lb. tins and 28 lb. buckets — and it's a paste : there's no waste.

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CHEMICO

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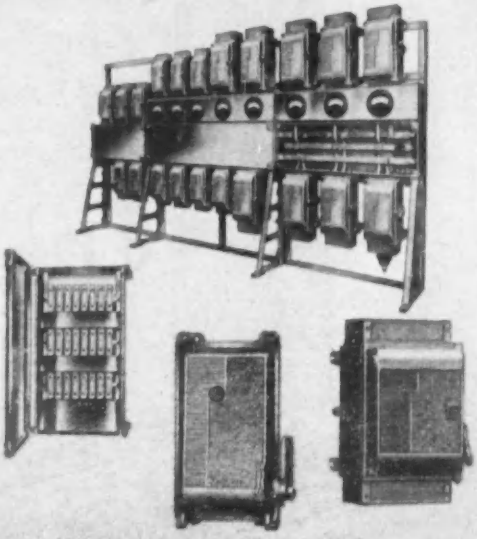
THE COUNTY CHEMICAL CO. LTD. · SHIRLEY · BIRMINGHAM

You cannot buy better gear



THE COMPLETE
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by

- INDUSTRIAL PANELS
- "VERTEX" DISTRIBUTION BOARDS TO 300 AMPS
- "ROYAL" SWITCHFUSES TO 100 AMPS
- "IMPERIAL" FUSE SWITCHES TO 600 AMPS

INDIVIDUAL LEAFLETS AVAILABLE.

BILL SWITCHGEAR LTD.
ASTON LANE · PERRY BARR
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LONDON, S.W.1. A. W. ZELLEY. H. PAYNE. 61 PETER ST. | MIDLANDS. G. H. GARBETT. H. WILLIAMS. HEAD OFFICE. | NORTH MIDLANDS. C. G. BACHELOR. HEAD OFFICE. | CHELTENHAM C. GEARING. LECKHAMPTON HILL | MANCHESTER 3. H. H. POLLARD. WOOD STREET. | BRISTOL 3. W. L. WHITE. CHURCH LANE | LEEDS 7. N. SHARPLES 2 LOVELL RD. | GATESHEAD 8. S. J. DAVIS. 252 PRINCE CONSORT RD. | GLASGOW J. D. HARRIS. ST VINCENT LANE

CAPACITORS *by* Standard

"Standard" design and manufacture power factor correction capacitors to suit any load, at high or low voltages, and with fully automatic operation if required. Our engineers will gladly examine your problem and submit their recommendations.

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POWER LINE DIVISION, North Woolwich, London, E.16, England. Telephone: Albert Dock 1401

BRITISH-MADE
SILICONES
in CLASS H Transformers

WHAT IS A CLASS H TRANSFORMER?

It is a dry-type transformer designed for operation at the new 'Class H' insulation temperature rating which allows a 'hot spot' temperature of 180°C. Under normal operation the winding temperature may rise to 140°C above an ambient temperature of 40°C.

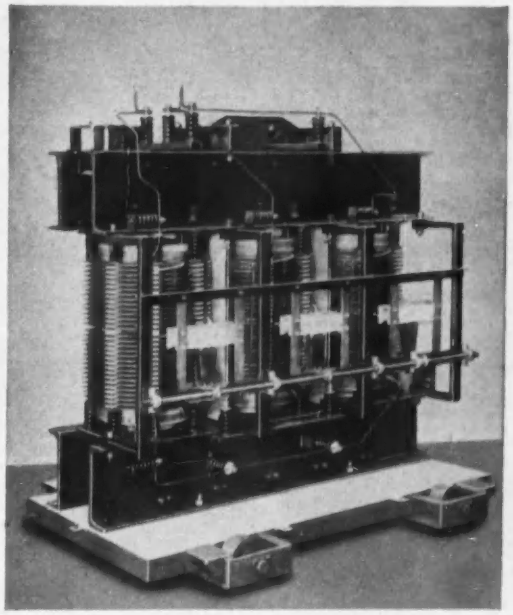
WHAT INSULATING MATERIALS CAN STAND THIS TEMPERATURE?

Silicone resins and silicone rubbers in combination with mica, glass fibre or asbestos. Such insulation will withstand temperatures at least 50°C above the limits for Class B insulation. Even when disintegrated by long exposure to very high temperatures, silica is produced which is itself a good insulator, instead of the carbonaceous products characteristic of organic materials.

WHAT ARE THE ADVANTAGES OF A CLASS H TRANSFORMER?

1. It is smaller in both size and weight than an equivalent Class B transformer.
2. It may be energised after standing in damp conditions because silicones make the insulation highly water repellent.
3. NO FIRE RISK. The danger of fire or explosion generally associated with transformer failures is, in practice, eliminated. Overload tests have shown that at temperatures approaching the melting point of copper, silicone-bonded insulation does not catch fire or produce sufficient decomposition products to be ignited by a spark within a sealed unit.
4. Due to their greater safety, Class H transformers provide a reliable and safe solution for site conditions which preclude the use of oil.

Write to our Electrical Dept. about silicone electrical applications.



This is an 11 KV, Class H, dry-type transformer built by Brentford Transformers Ltd. Class H dry-type transformers, either aircooled or sealed in nitrogen, are now being manufactured up to 2,000 kVA rating.

***Visit our* STAND NO. 44**

at the

B.E.P.C. EXHIBITION

where more information is given of our range of silicones and their uses in the Electrical Industry.

June 27th—July 1st

SPORTS STADIUM · WEST STREET · BRIGHTON

MIDLAND SILICONES LTD

(associated with ALBRIGHT & WILSON Ltd. and DOW CORNING CORPORATION)

first *in British Silicones*

MS

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YSW/MS 60

FAIR PLAY

SWITCH BLOCKS
built of* KILN DRIED *timber
STAY FLAT
AND CORRECT SHAPE

We invite your enquiries

WOOTTON & CO. LTD.

ALMA WORKS, PONDERS END
MIDDLESEX
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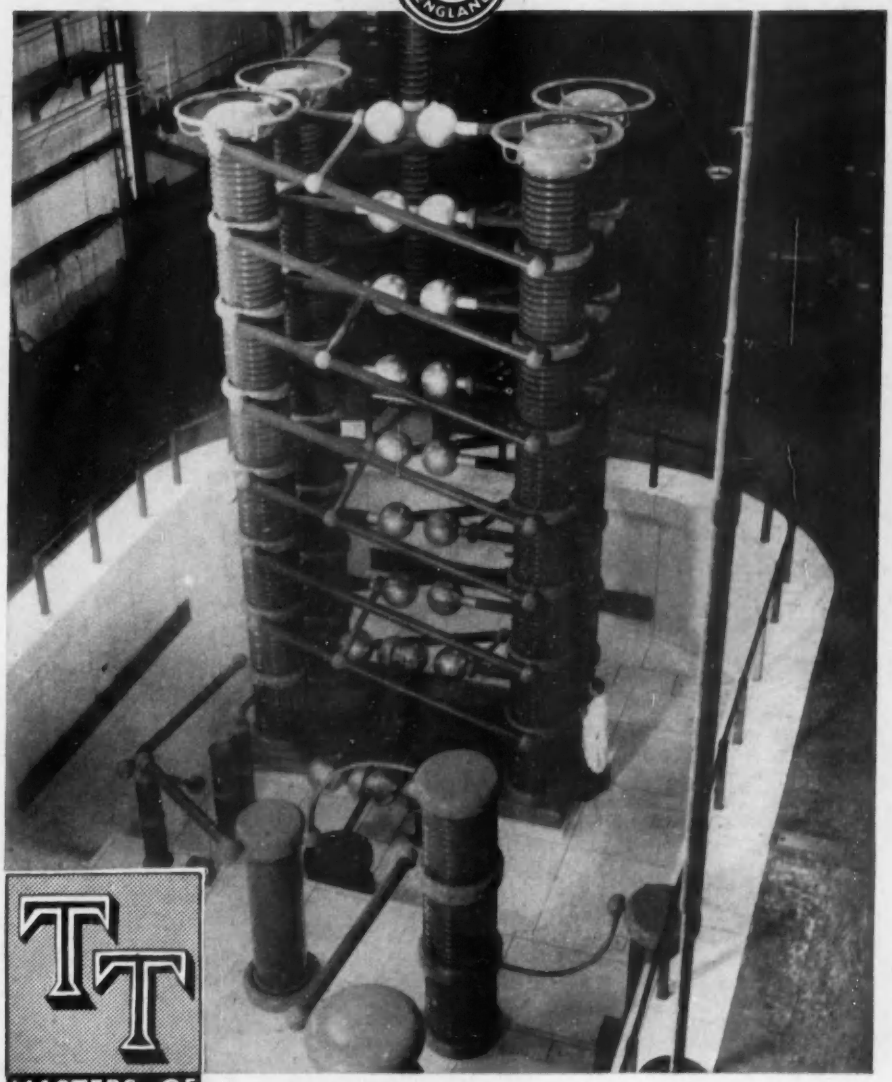
Of tubular construction with no connection to the outside atmosphere, these PREMIER Coolers of advanced design have already been installed in many important power stations both in Britain and abroad.
PREMIER
CLOSED CIRCUIT AIR AND HYDROGEN COOLERS

THE PREMIER COOLER & ENGINEERING CO., LTD., SHALFORD, near GUILDFORD, SURREY

Over Eighty Eight Years of Service to the Electrical Industry...



MASTERS OF PORCELAIN INSULATION

THIS 3.2 MILLION VOLT 77KW SECONDS SURGE GENERATOR, recently installed at the National Physical Laboratory, Teddington, is believed to be the largest in this country. Each of the eight stages consists of two capacitors, in separate T.T. porcelain housings, to provide a total stage capacitance of 0.12 μF. The maximum stage voltage is 400 kV.

THE GENERATOR

USES T.T. PORCELAIN INSULATORS THROUGHOUT

Acknowledgments are made to the Department of Scientific and Industrial Research for permission to publish the photograph and to Messrs. Ferranti Ltd., who designed and constructed the generator.

TAYLOR TUNNICLIFF & CO. LTD.

Head Office : EASTWOOD, HANLEY, STAFFS.
Telephone : Stoke-on-Trent 25272-4

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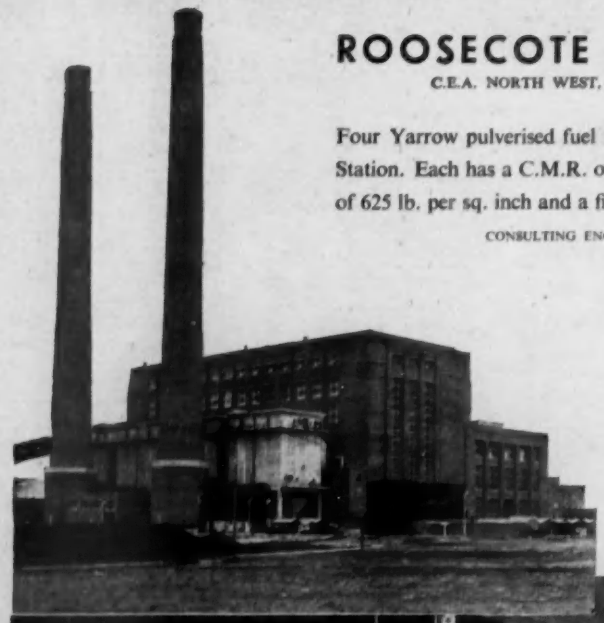
YARROW BOILERS

ROOSECOTE POWER STATION

C.E.A. NORTH WEST, MERSEYSIDE & NORTH WALES DIVISION

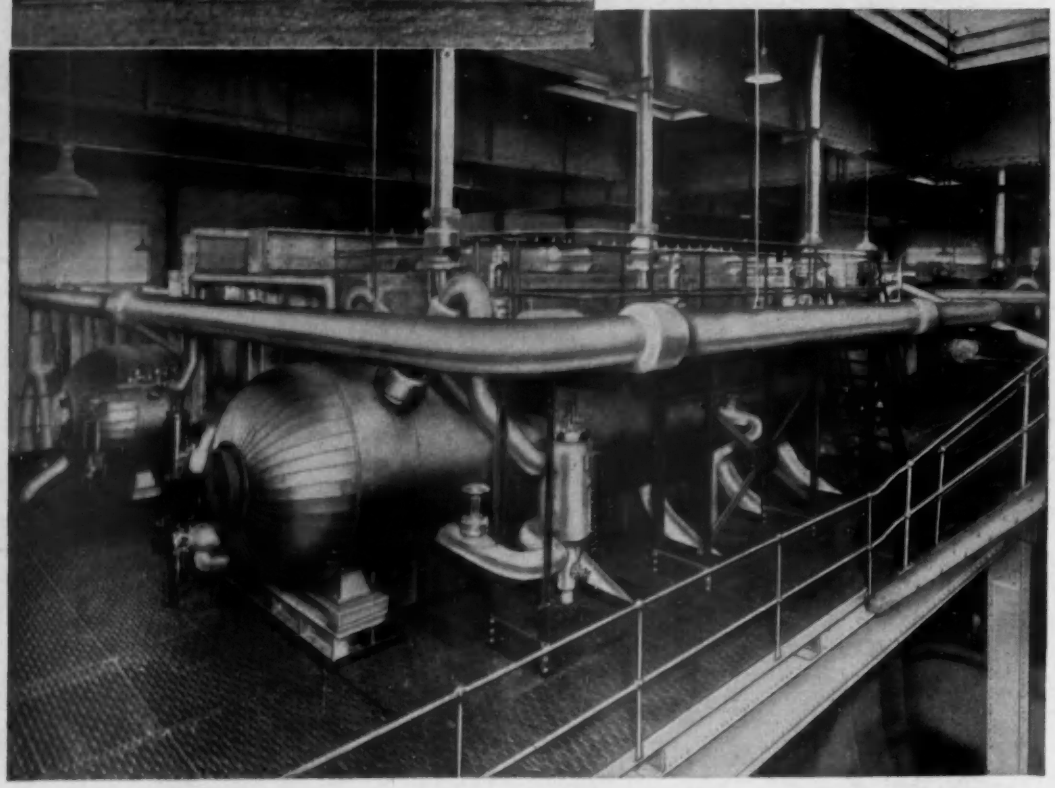
Four Yarrow pulverised fuel fired boilers are installed at this 120 M.W. Station. Each has a C.M.R. of 300,000 lb. of steam per hour at a pressure of 625 lb. per sq. inch and a final steam temperature of 865°F.

CONSULTING ENGINEERS: MERZ AND McLELLAN



Yarrow and Co. Ltd have been designing and manufacturing Water Tube Boilers for almost seventy years and are fully equipped to supply complete steam generating plant in a range of designs and sizes to suit any operating conditions.

View at Boiler Drum level

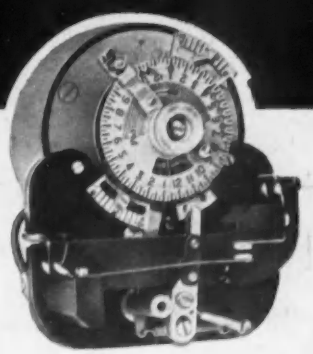


YARROW & CO. LTD · SCOTSTOUN · GLASGOW

VENNER

AUTOMATIC

street lighting control



Venner double circuit time switches are particularly suitable for full and half night control of street lighting incorporating two or more lamps. Appreciable saving in electricity cost is achieved by automatically switching off a percentage of lamps from midnight to sunrise when full brilliance is not required.

VENNER
TIME SWITCHES

Type MSDC (shown here with insulating cover removed) is a synchronous motor driven double circuit solar dial time switch. Complete in dustproof metal case, it is small enough to be fitted in street lighting columns.

Write for illustrated leaflet ET/4.

VENNER LIMITED
Kingston By-Pass, New Malden, Surrey.
Telephone: Malden 2442.

Associated Companies: Venner Accumulators Ltd., Venner Electronics Ltd.

QUALITY PRODUCT

BUSBAR CHAMBERS

available from
100 amps. — 2000 amps.

— in —

2, 3 and 4 bar
assemblies
together with complete
range of Circuit Clamps.

FEATURES:

★ Easy extension.

★ Mechanical grip type Circuit Clamps.

★ Busbars can be changed to next larger size with same supports.

KEEN PRICES
QUICK DELIVERY

Write for Leaflet No. BC1

OTHER PRODUCTS: Busbar Trunking: Cable Trunking: Cable-Tap System: Rising Main System: Fuse Units: Fuseboards: Switchfuses: Switchboards & Accessories.

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see our full range of
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on

STAND No. 78

B.E.P.C. Exhibition

June 27 — July 1

This will include a 13 amp. range and waterproof range

CLANG
REGISTERED TRADE MARK

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We don't understand this picture either. The artist was told to illustrate our products and those of our Principals: soft annealed copper wire for power or telephone cable . . . hard drawn copper wire for telegraph and telephone wires . . . drawn copper strip for use in electric motors, transformers and switchgear . . . copper wire for non-electrical uses . . . galvanised steel wire for cable armouring . . . jute yarns and roves . . . varnished cambrics and cotton yarns for covering . . . rubber for insulating . . . lead compounds for impregnating.

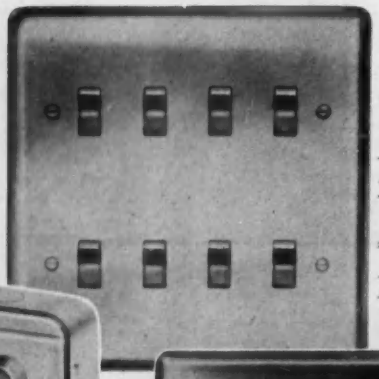
Please do not write—except about these products. Telephone: Abbey 2771.

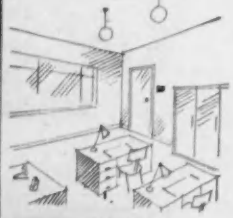
R. H.
SYMONDS
LTD.

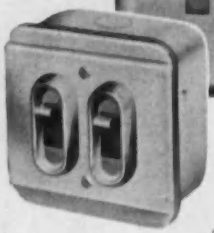
47 VICTORIA ST., LONDON, S.W.1

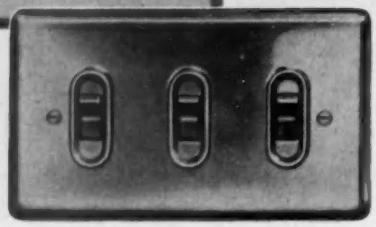
MK 110 DHB

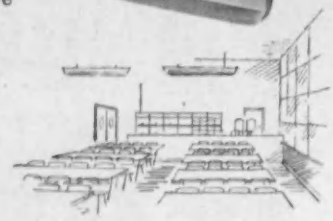
1 standard switch for every type of installation









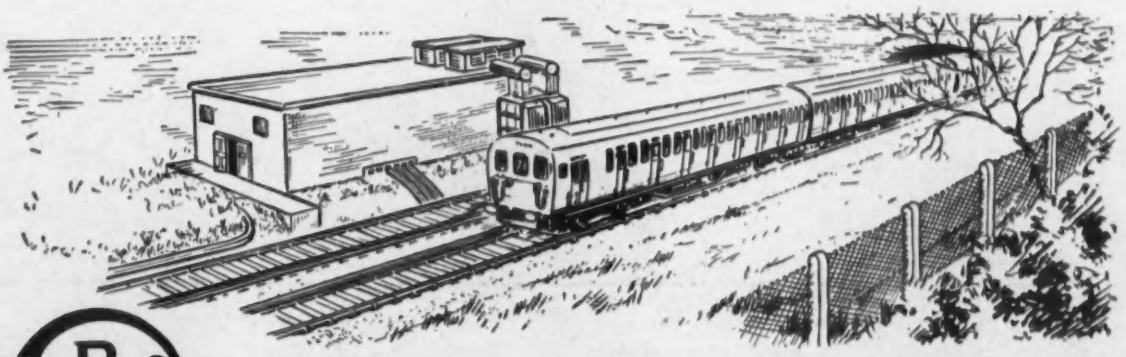


Not a Contractor's dream, but a fact at last with the new MK Gridswitch. Using interchangeable components you can build up a variety of styles for every need. Both insulated and brass plates are available and the same basic switch units and boxes are standardised for flush and surface work. The Gridswitch can be used throughout the large installation where differing finishes and designs are required—in a large hotel, for example, from the public rooms to the kitchens and the garages. Only three boxes are needed for a full range up to eight gangs and every component is completely interchangeable.

Write today for leaflets 231 and 232 which describe the many attractive features of this range.

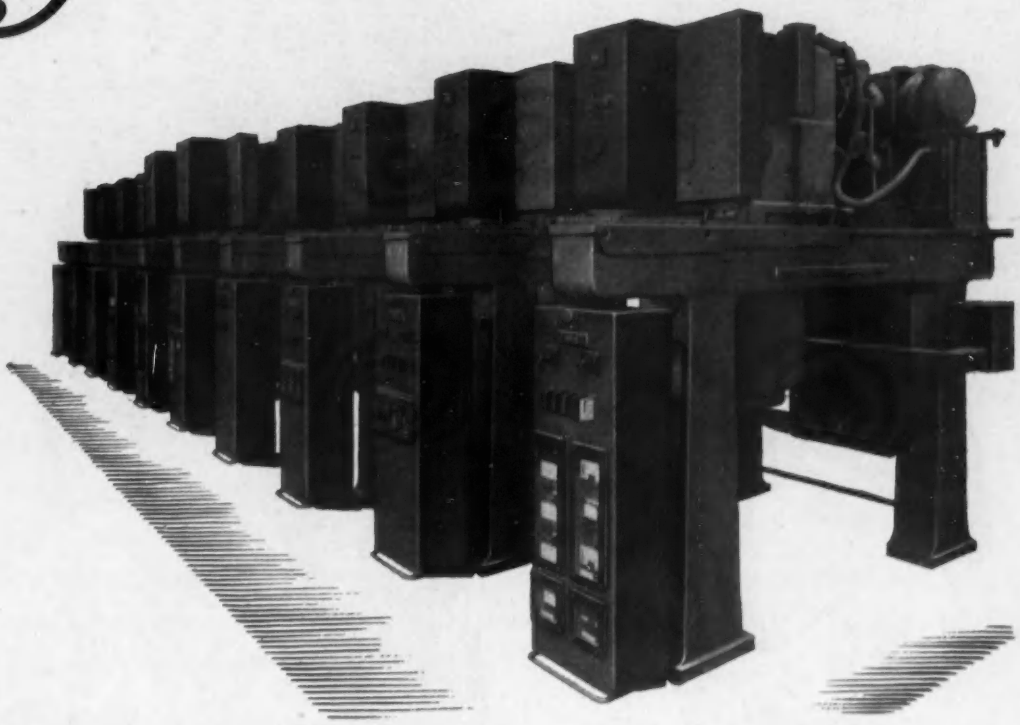
THE MK GRIDSWITCH

M. K. Electric Limited, Wakefield Street, London N.18 *Edmonton* 5151



B T-H

switchgear for 20 substations



For the change of frequency scheme at present in progress on the Southern Region of British Railways, one hundred and three BTH 33-kV, 750-MVA single-bus, metalclad compound-filled equipments are being installed in twenty traction substations. The illustration shows the switchboard at Lewisham Switching Station, which was the first to be commissioned.

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THE BRITISH THOMSON-HOUSTON COMPANY LIMITED · WILLESDEN · ENGLAND

Member of the AEI group of companies

A4775

LIGHTING

In public halls and civic assembly rooms the need for emergency lighting is now accepted. In future buildings of this sort the stand by electrical system will be planned at the same time as the main lighting is planned. Chloride Batteries Ltd. makers of Keepalite, the automatic emergency lighting system, offer the advisory services of their engineers to architects and electrical contractors in any part of Britain.

Keepalite
FOR PUBLIC HALLS

A Product of Chloride Batteries Limited, Exide Works, Clifton Junction, Swinton, Manchester and Grosvenor Gardens House, Grosvenor Gardens, SW1 S.73A

618 MVA

Fuller Transformer capacity built and installed at Littlebrook Power Station in the South Eastern Division of the Central Electricity Authority. This total comprises the following equipments.

Four 73 MVA Generator Transformers 11/132 kV (one unit under construction).
Two 73 MVA Generator Transformers 11/66 kV.
One 73 MVA Generator Transformer 14/132 kV.
Two 45 MVA Interconnector Transformers 132/66 kV with on-load Tap-changers.
One 10 MVA Station Transformer 132/6.15 kV with on-load Tap-changer.

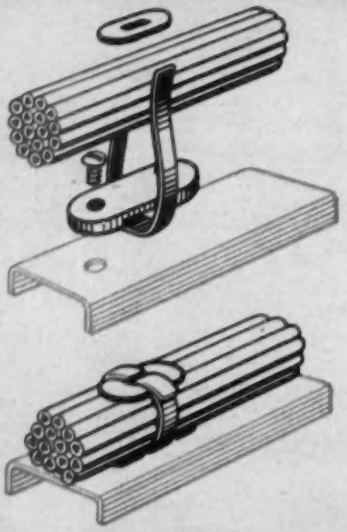
Fourteen Auxiliary Transformers totalling 7 MVA.

Photograph by Courtesy of Central Electricity Authority, South Eastern Division
Consulting Engineers: Messrs. Merz & McLellan

FULLER

FULLER ELECTRICAL & MANFG. Co. LTD.
Associated with ASEA Electric Ltd.
FULBOURNE ROAD, WALTHAMSTOW, LONDON, E.17.
Phone: LARkswood 2350 (10 lines) Also at: BIRMINGHAM, GLASGOW, MANCHESTER, DUBLIN.

THE BETA SYSTEM OF CABLE FIXING for SWITCH CUBICLES and CONTROL PANELS



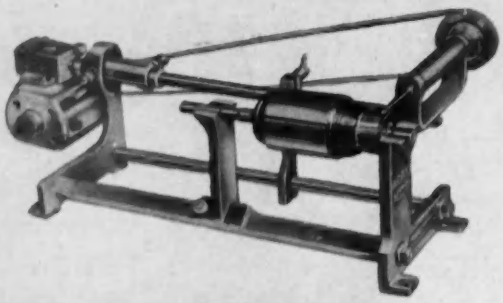
THE BETA SYSTEM USES 4 COMPONENTS ONLY

1. A moulded saddle
2. A standard 4 B.A. or self-tapping screw
3. A length of BETA strip
4. A plastic buckle

All components except screw, which is sunk, are fully insulated and can be safely used with unbraided P.V.C. cables.

Send for fully descriptive leaflet and prices

CRITCHLEY BROS LTD. BRIMSCOMBE STROUD GLOS. Phone BRIMSCOMBE 2208



MARTINDALE

See our exhibits at the **BRITISH ELECTRICAL POWER CONVENTION** Brighton 27th June to 1st July on STAND No. 89

AERO-AUTO UNDERCUTTER

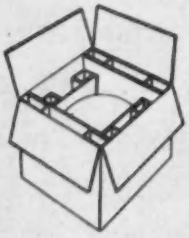
An inexpensive and reliable machine for the rapid undercutting of micas of small armatures as used in automobile dynamos and starters, and in aircraft electric motors.

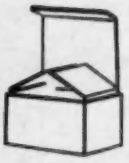
Write for descriptive leaflet to:

MARTINDALE ELECTRIC CO. LTD.
45 WESTMORLAND ROAD, LONDON, N.W.9
also at 25 ELMBANK STREET, GLASGOW, C.2

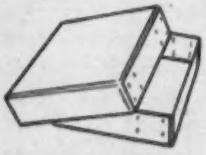
Have you a PACKAGING PROBLEM?

PERHAPS WE CAN HELP...





We are manufacturers of Corrugated and Fibre board containers. Rigid and collapsible boxes of all types. And can supply from stock Corrugated Rolls. Wood Wool Packing.



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The Ferranti 3½" hermetically sealed instrument in steel case with fixing flange has received Design Approval from the Joint Service Radio Components Standardisation Committee. This instrument is designed to comply with RCS.231 and RCL (PROV) 231

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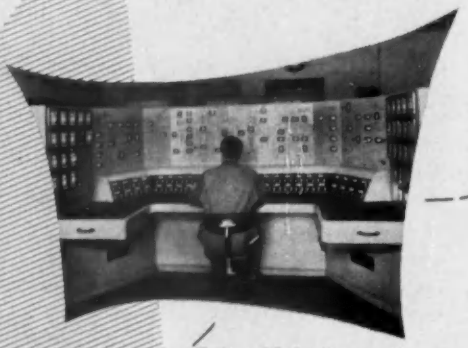
For those remotely interested in Instrumentation and Controls



The Control Desk at Grangemouth Refinery of Scottish Oils Ltd. For a general description, please write for publication J 272

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EVERSHED AND VIGNOLES LIMITED
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6/189

ALUMINIUM CONDUCTORS FOR ECONOMIC UNDERGROUND DISTRIBUTION

- LOW COST
- LIGHT WEIGHT
- EASE OF JOINTING
- STANDARD DIMENSIONS
- UNIVERSAL APPLICATION
- LONG LIFE AND RELIABILITY

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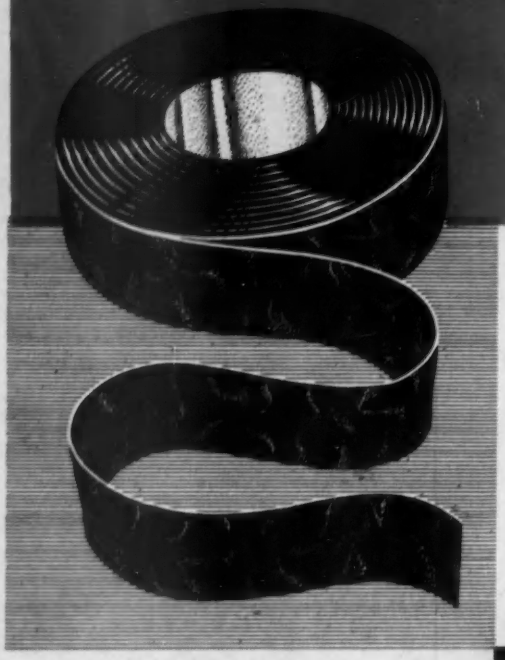

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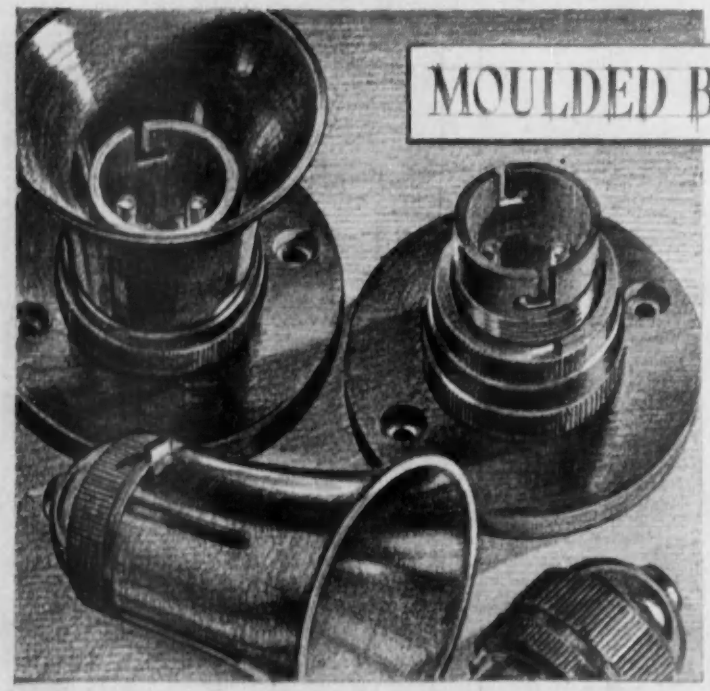

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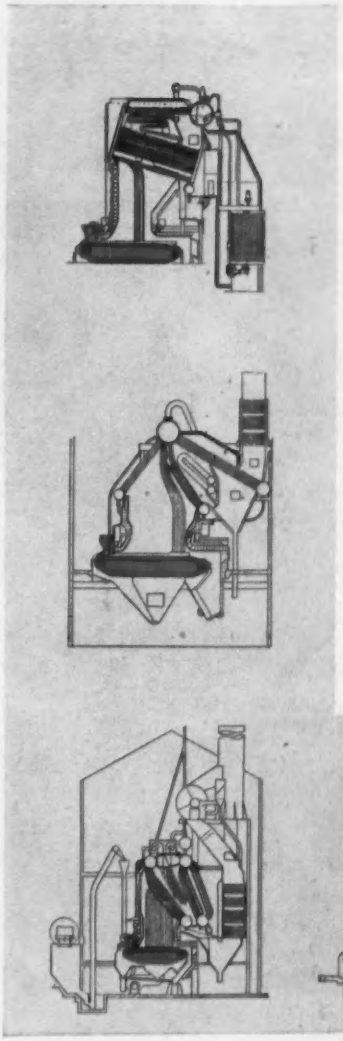

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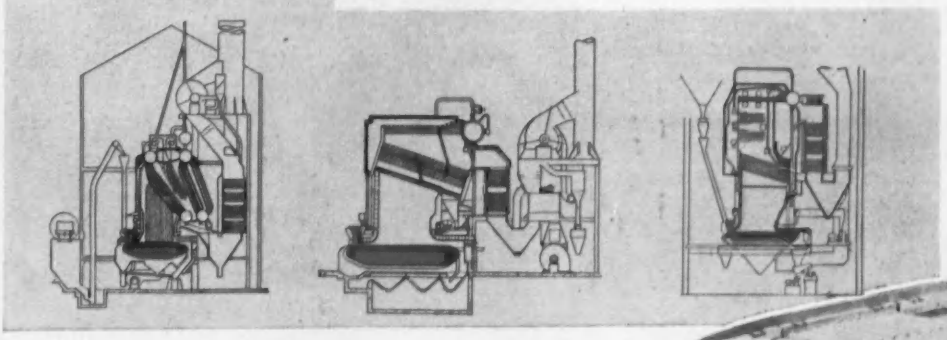

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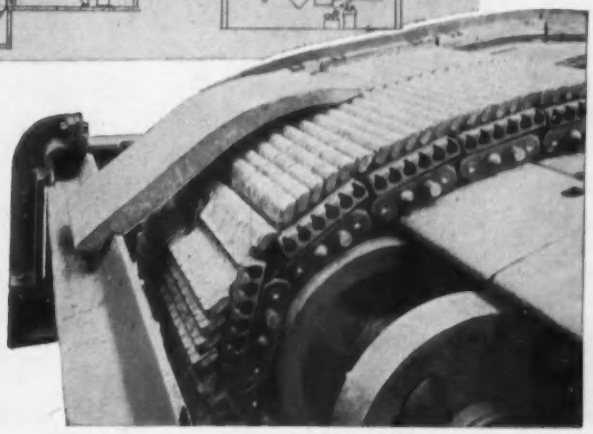

View of the rear end of an 'L' type travelling grate stoker

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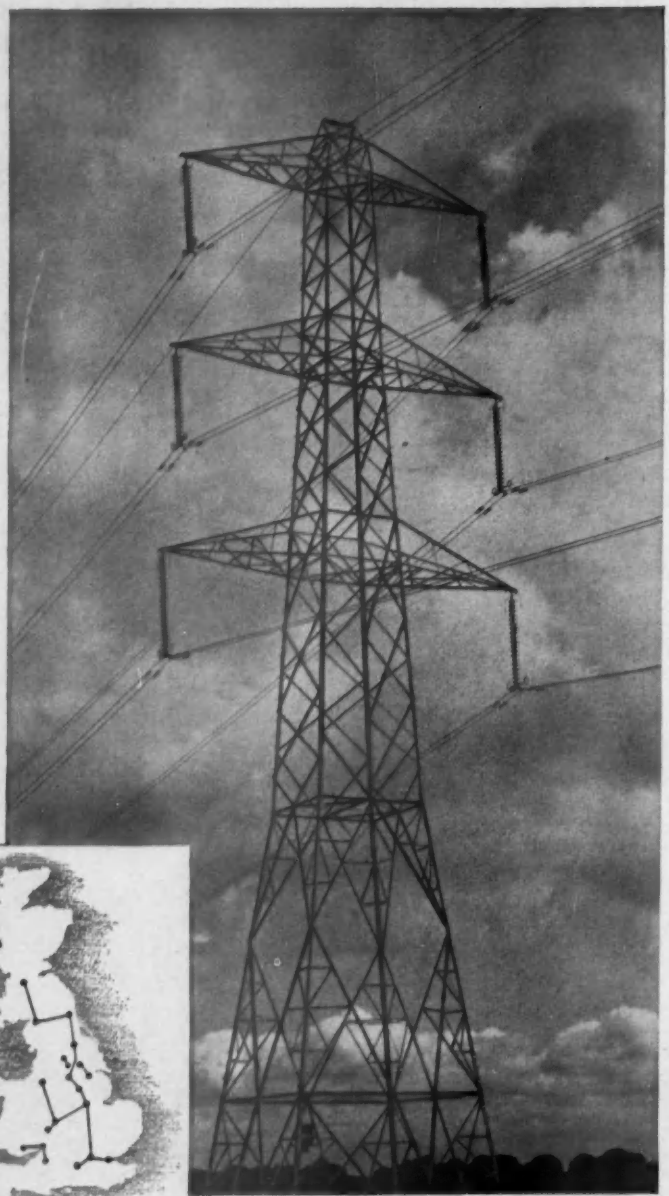

Photograph by courtesy of the Central Electricity Authority and their sub-contractors, Messrs. Balfour, Beatty & Co. Ltd.

For technical advice and literature, write to Pilkington Brothers Limited, Insulator Sales Department, Ravenhead Works, St. Helens, Lancs.

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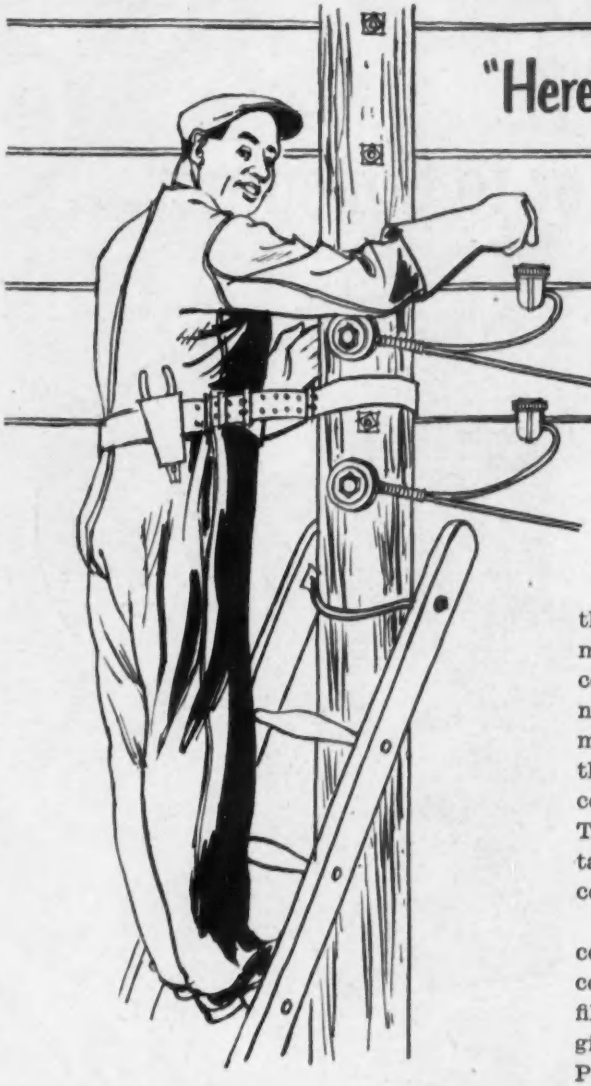

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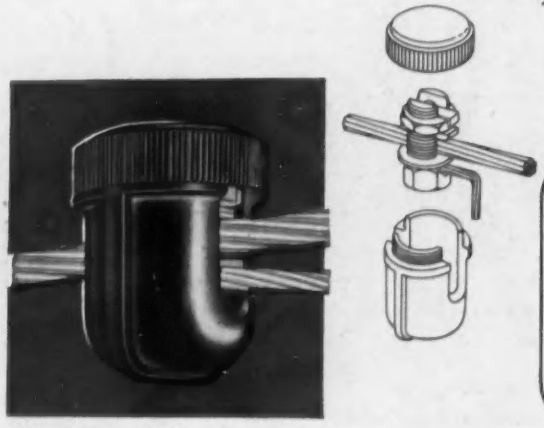

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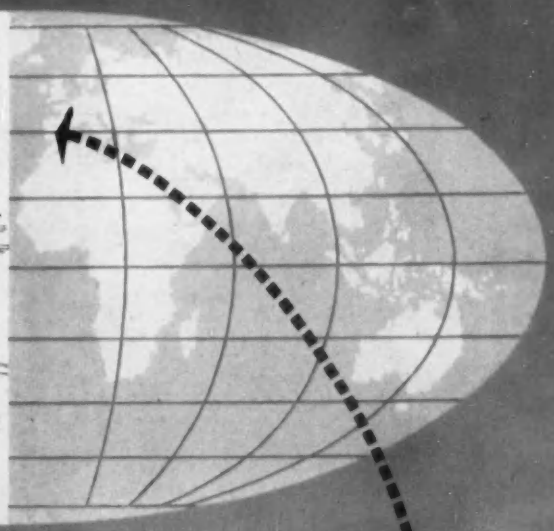

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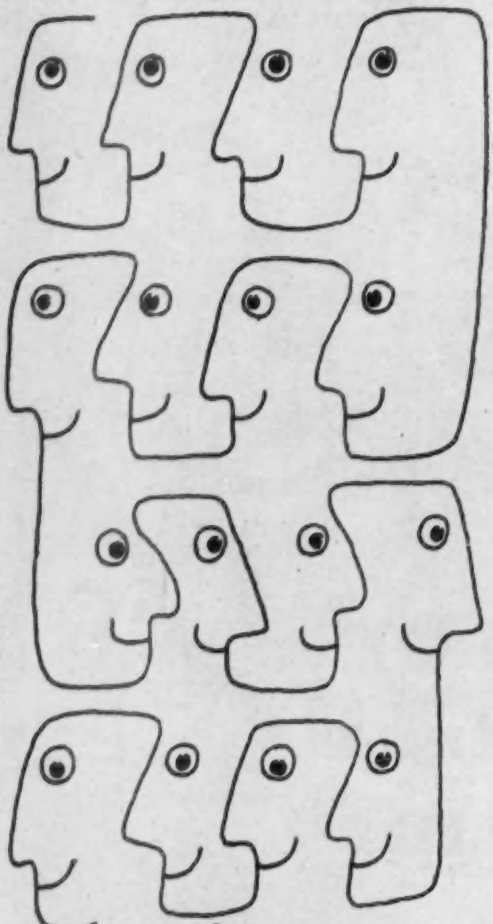

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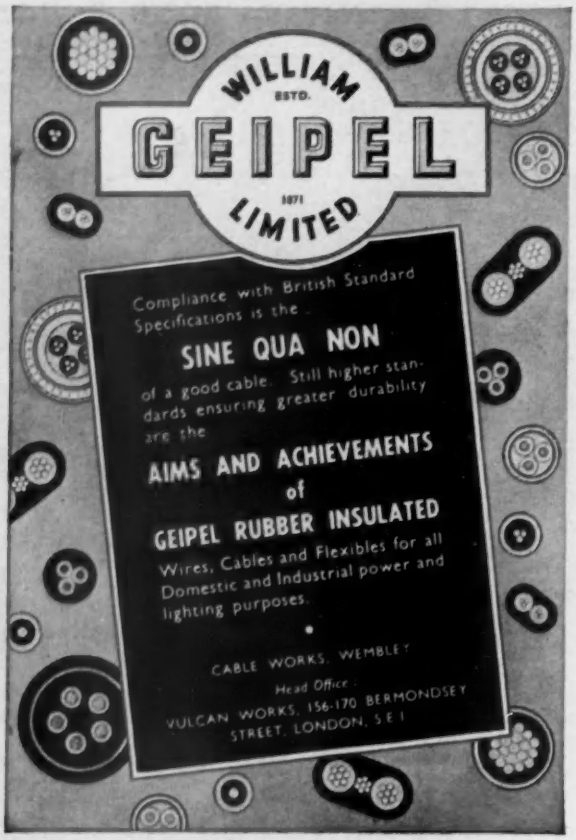

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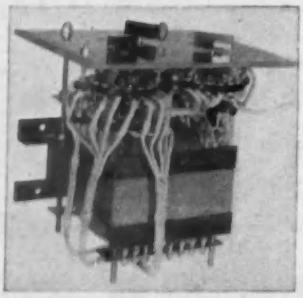

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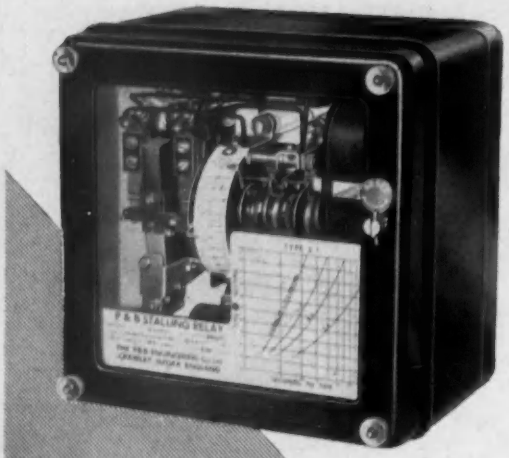

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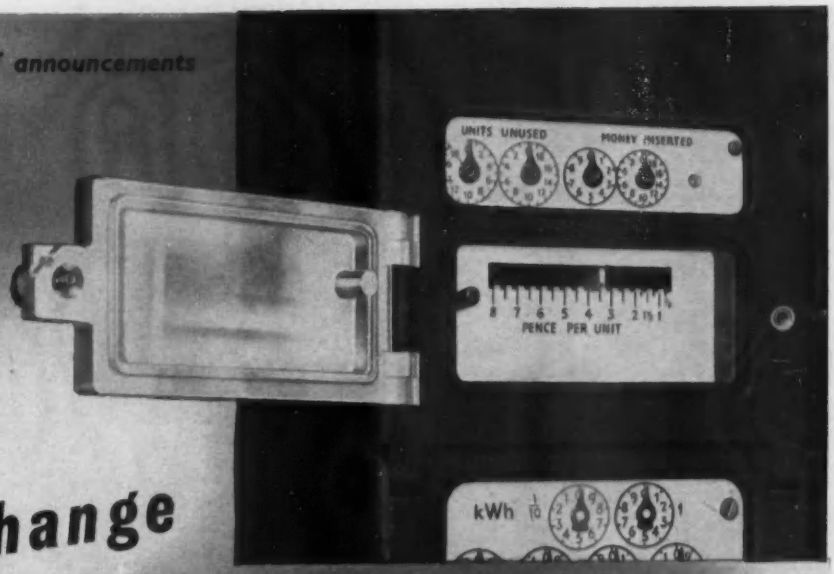

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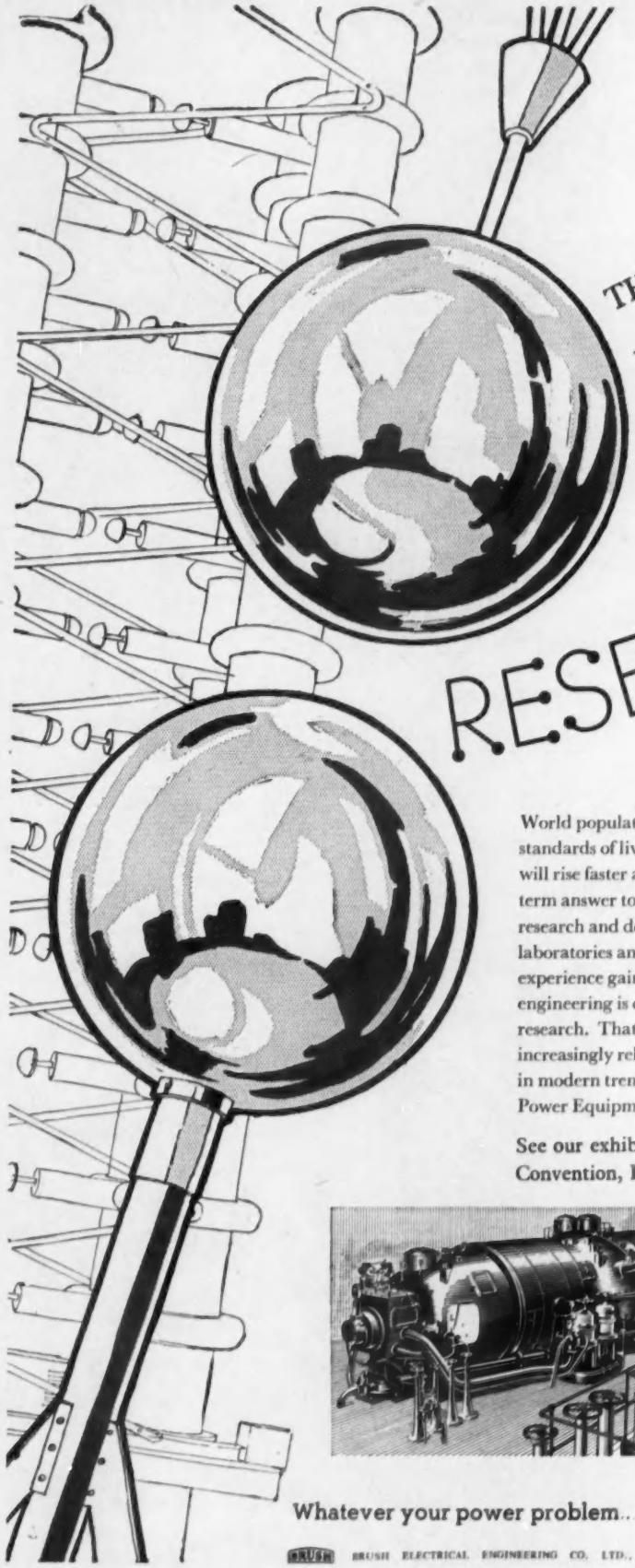

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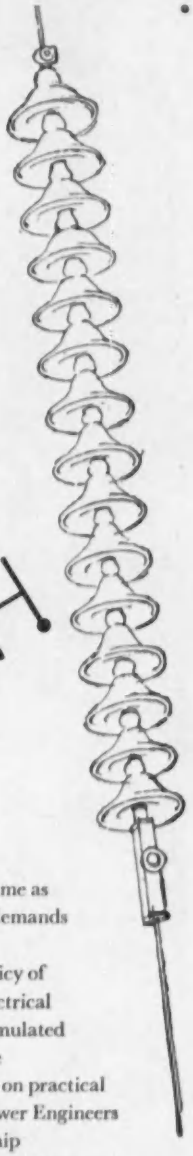

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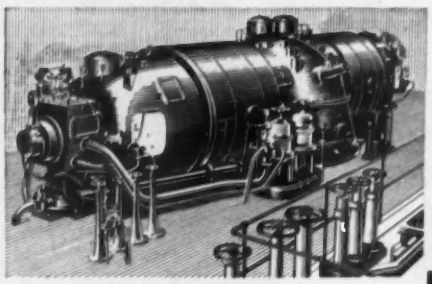

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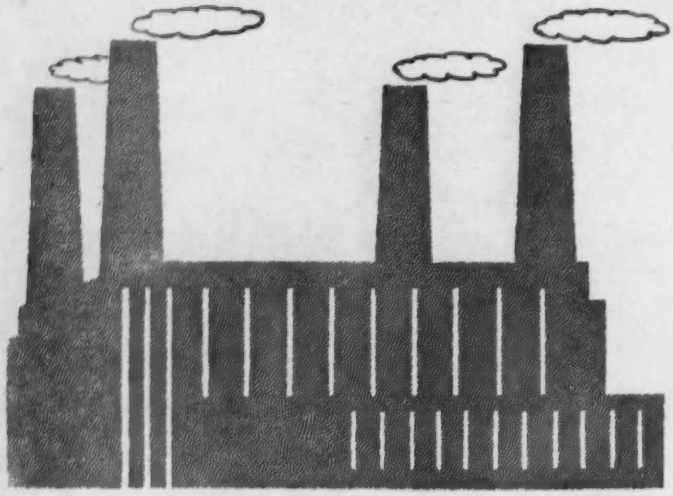

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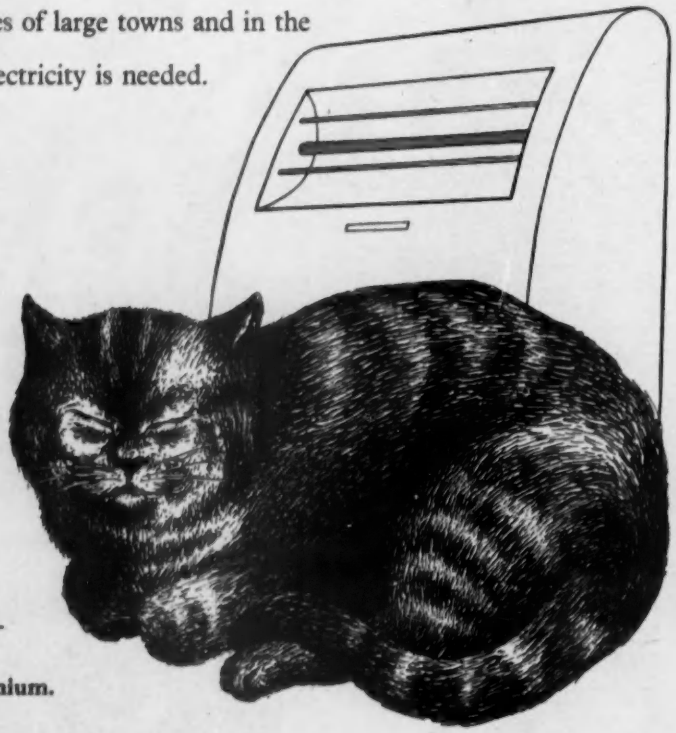

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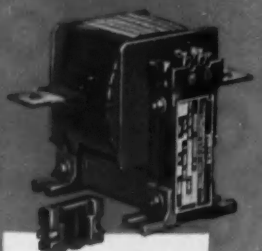

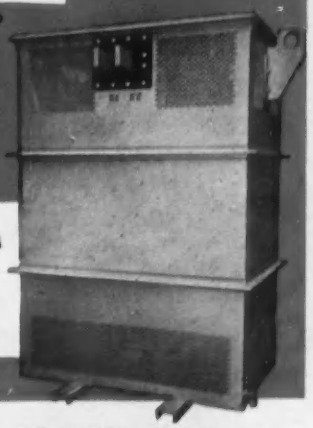

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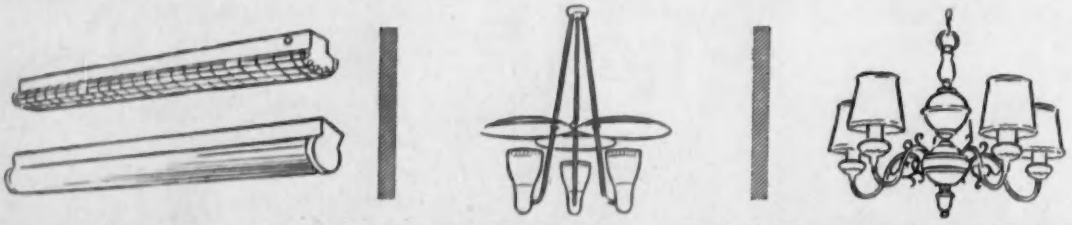

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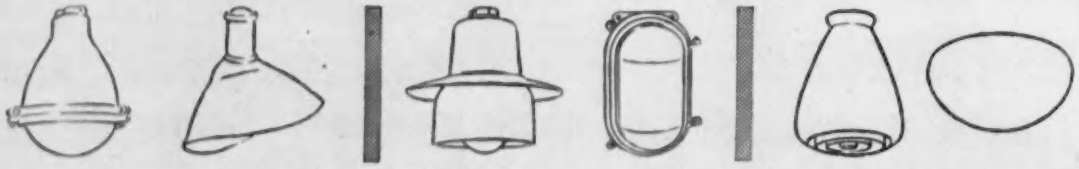

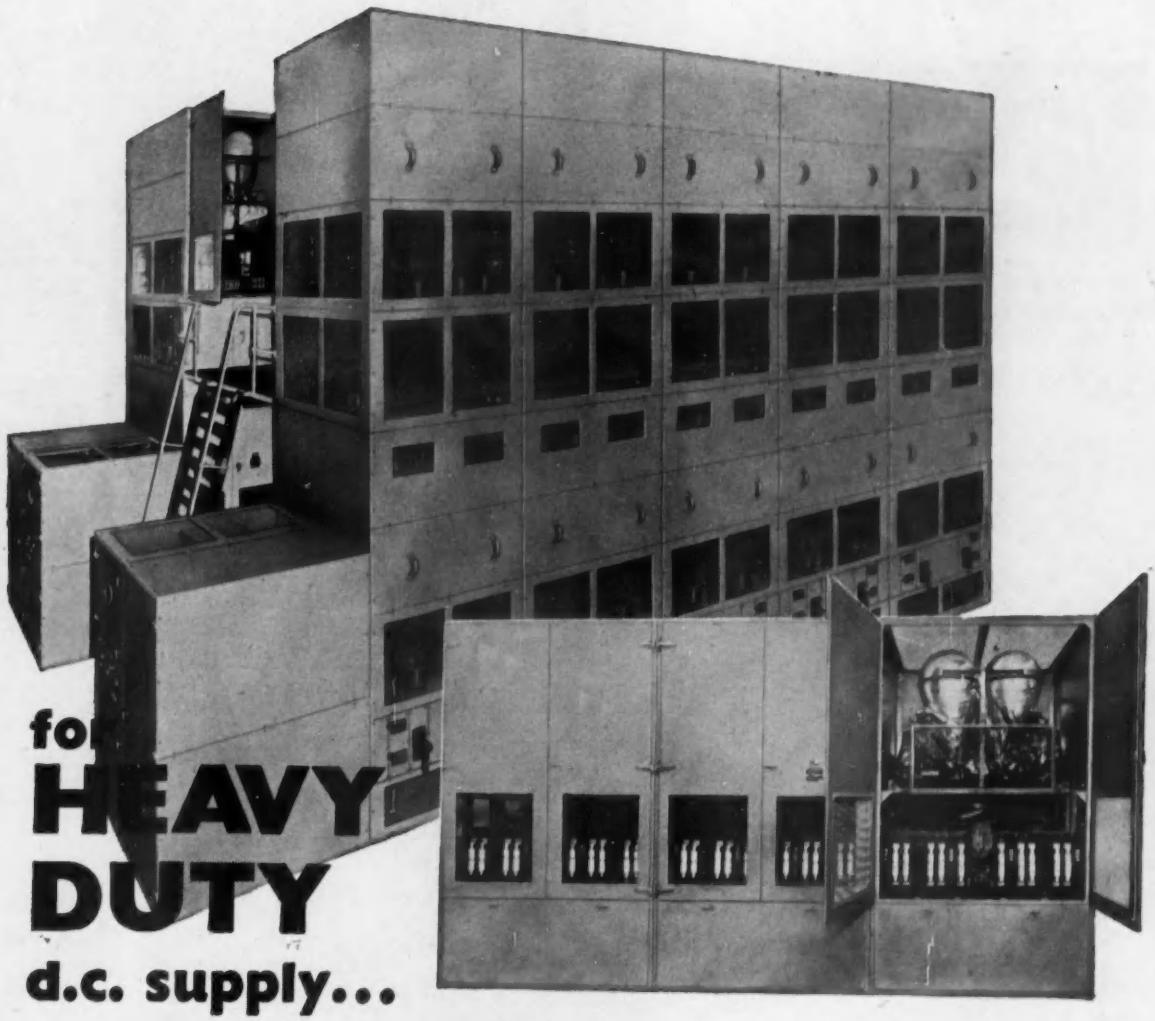

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The illustrations show: part of two 60,000 amp. 250/500 volt Hewittic rectifier installations for electrolytic duty overseas, and (inset) one of two 1,500 kW 3,000 volt Hewittic equipments for railway traction duty.

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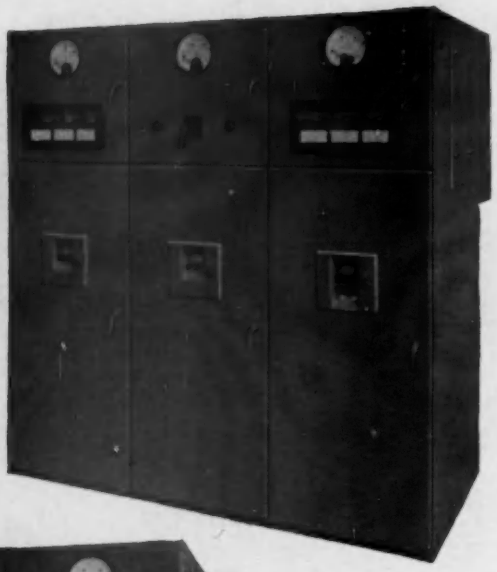

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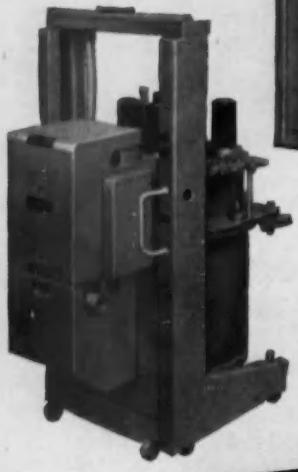

These three illustrations show the clean design. Cubicle doors open to allow breakers to be pulled forward on their trucks but, in addition, they can be readily removed from their hinges to give full access to the interior without obstructing the space in front of the switchboard.

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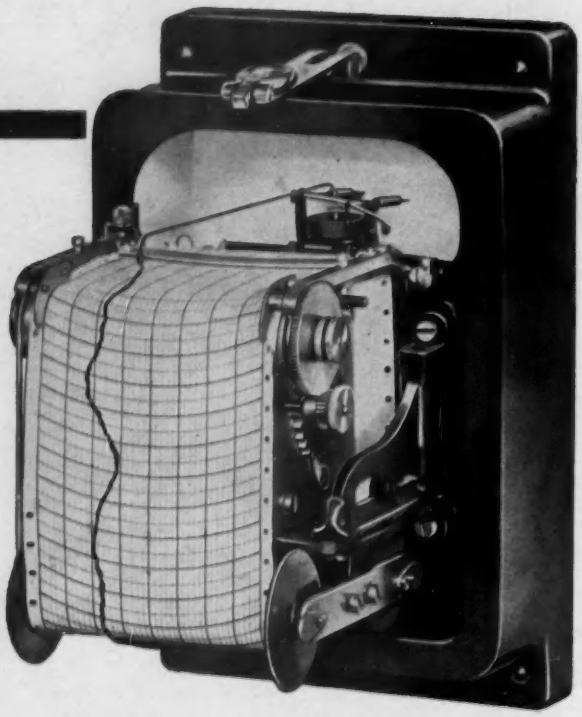

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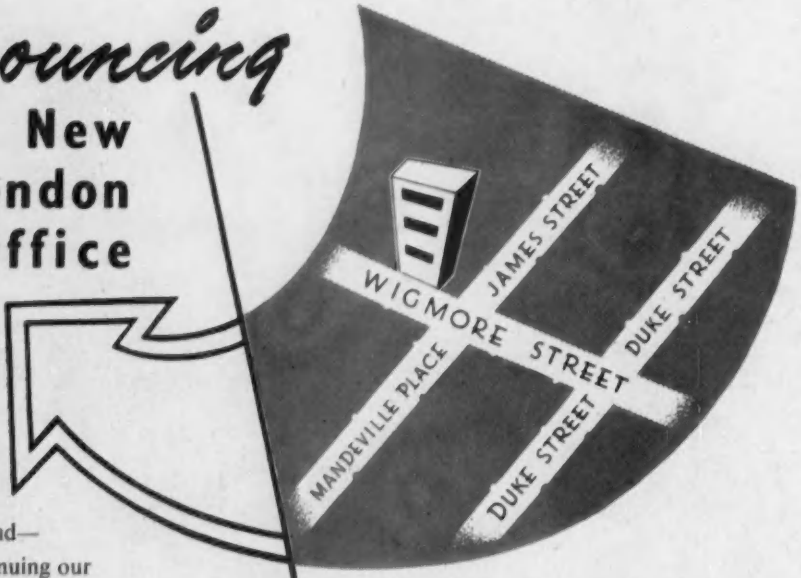

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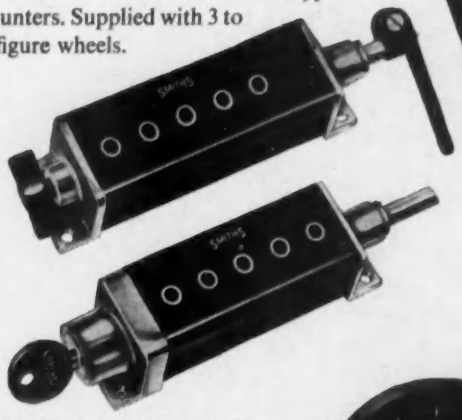

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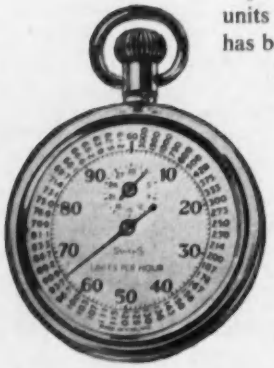

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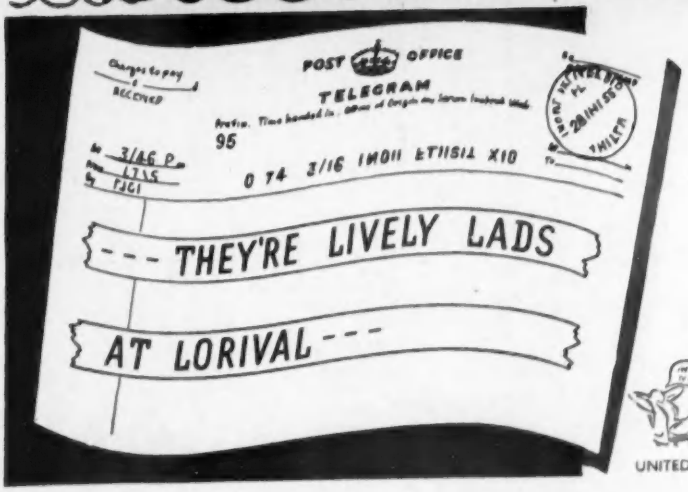

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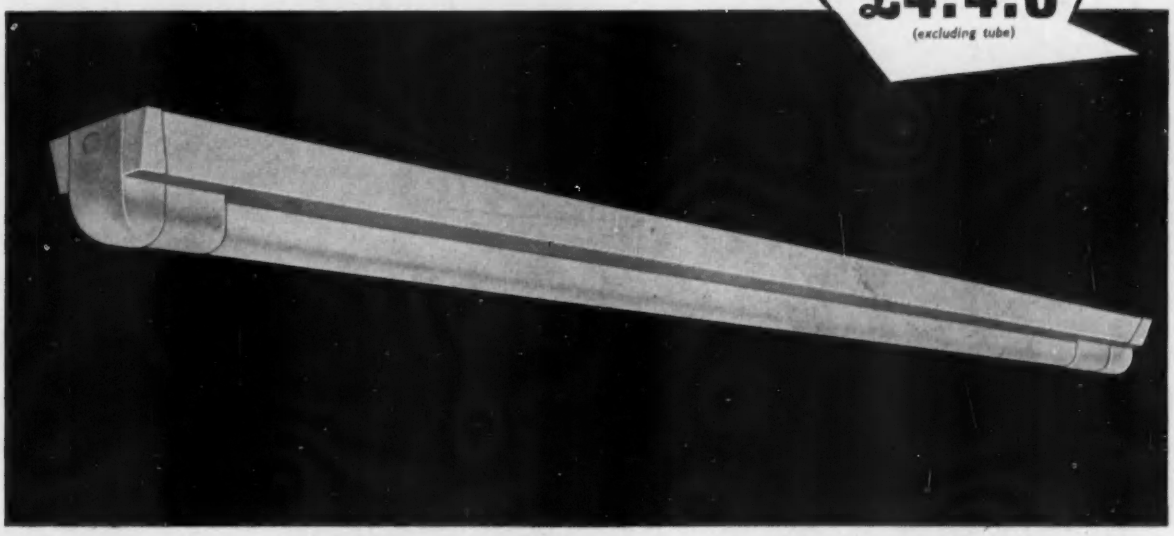

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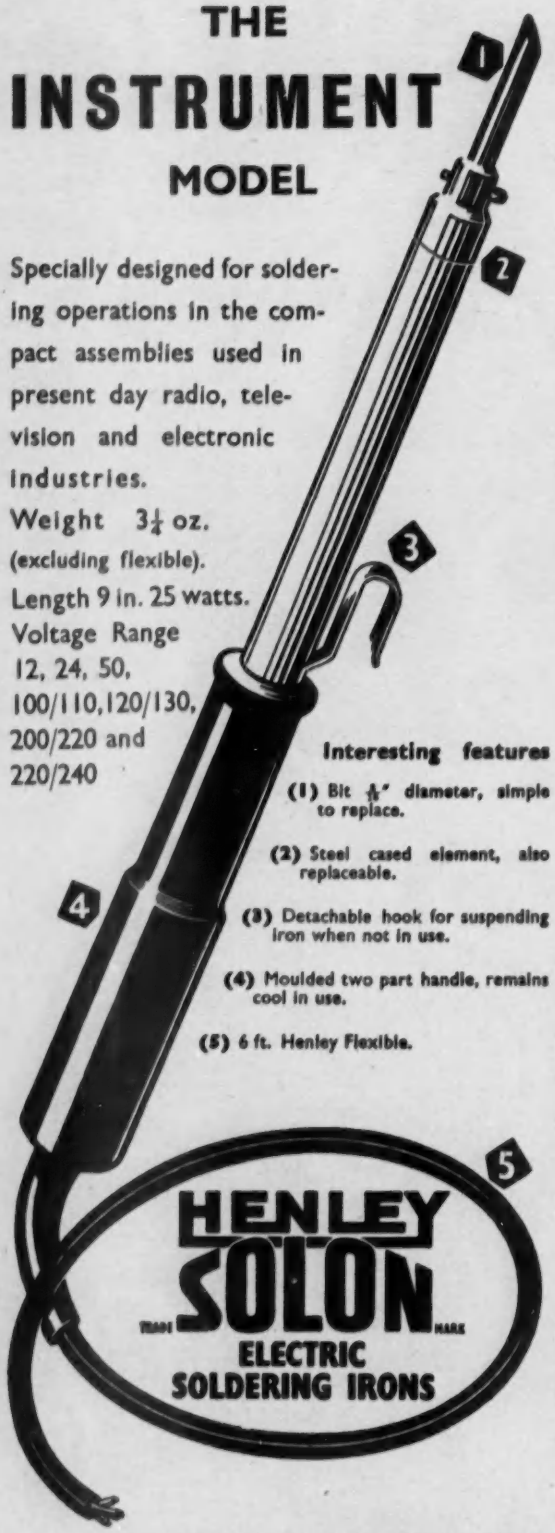

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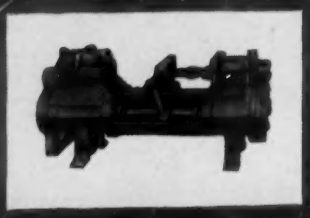
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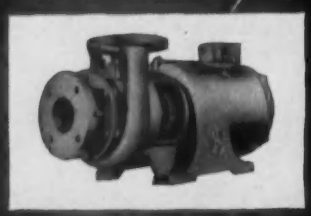
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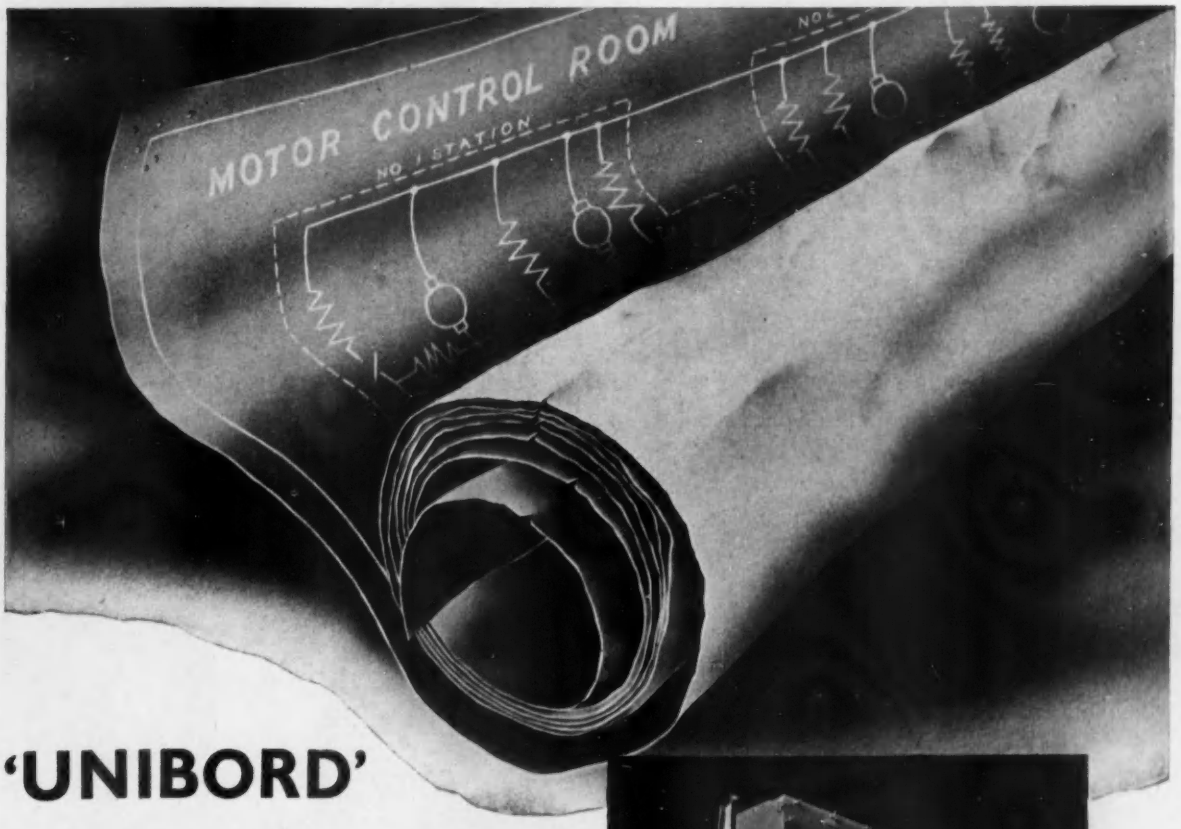

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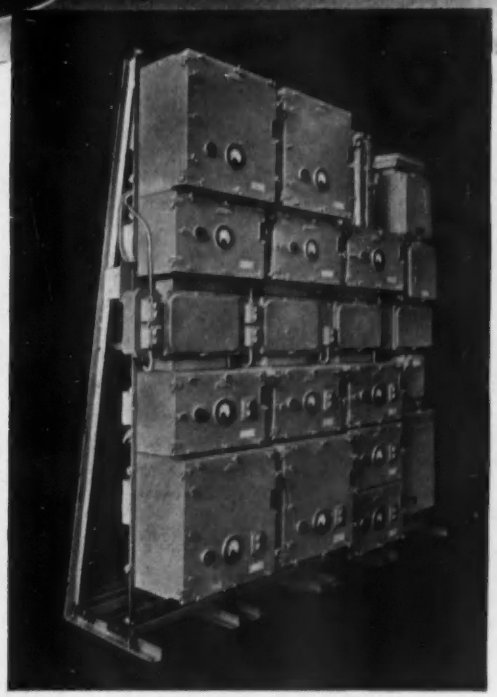

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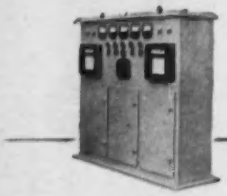

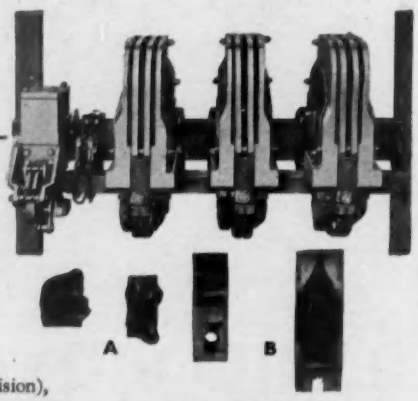

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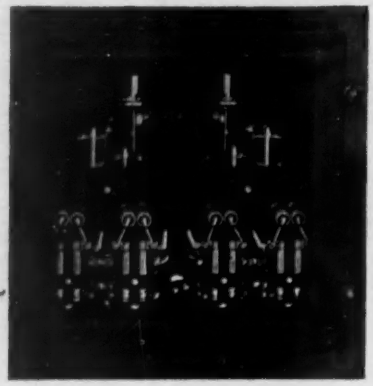

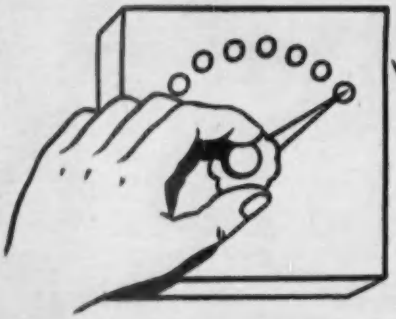

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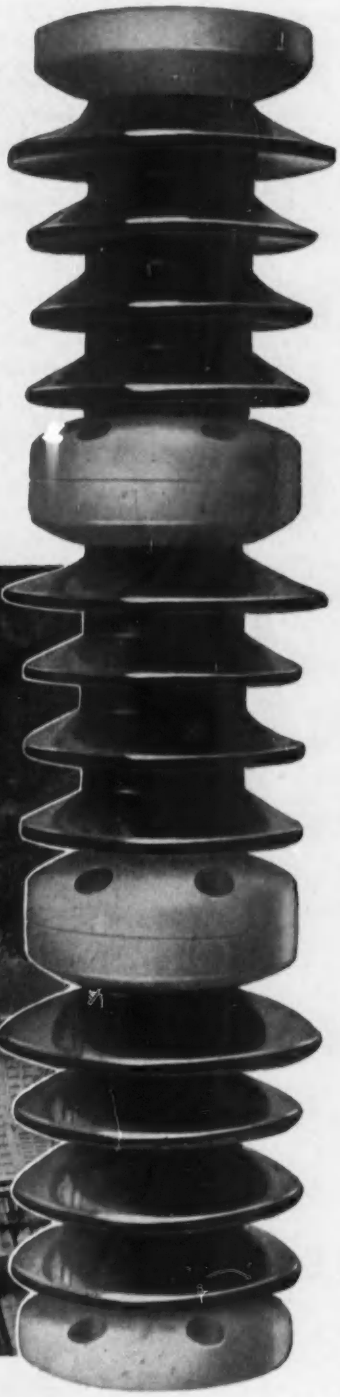

S.P.81

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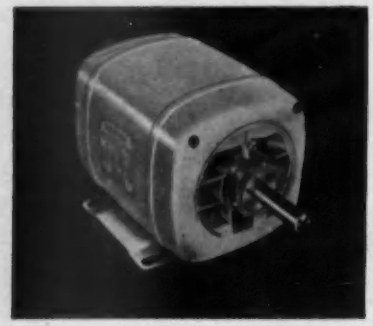

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KILLING THE GOOSE

Enquiries by the Monopolies Commission are concerned with determining whether certain trading practices are in the public interest; no one seems to worry whether the enquiries themselves are in the public interest. They must be so; Parliament has ordained it. Yet recent debates on monopoly legislation have been highly spiced with politics. There has been nothing of the thorough, if not wholly judicial, study apparent in monopoly reports. The mills of the Monopolies Commission may grind slowly but they grind exceeding small; so small perhaps that the end-product is hardly discernible by the public, for whose interest the complex machinery was constructed. The electrical industry might almost be said to have acquired an interest in this machinery, for including last week's announcement by the President of the Board of Trade, nearly twenty-five per cent of the references to the Monopolies Commission have been electrical, and the work by the Commission's staff must be sufficient to open a special electrical department. Why has our industry been singled out for such attention? There seems little doubt that this results from the highly organised character of the individual sections and in turn the organisation developed in consequence of the phenomenal rate of technical progress over the past fifty years. One would have thought that this continuing expansion was itself substantial evidence of the absence of unduly restrictive practices, but apparently this is not enough. Further enquiries are to be set in motion with all that they mean in expense, uncertainty and deployment of executive staff from productive to non-productive effort. This is hardly the way to increase our output of goods and with the faint tang that such an enquiry leaves behind, it is certainly not the way to step up exports. Yet the Government is deliberately aiming its shafts at this, the second largest exporting industry in the country!

AUTOMATIC CONTROL IN INDUSTRY

The lively attention being paid to "automation" outside immediate engineering and scientific circles has been well shown by the news value of the recent Conference of the Institution of Production Engineers on "The Automatic Factory—What does it Mean?" As might be expected, for a first conference, many of the papers covered much the same introductory ground, but from the remainder it was obvious how wide is the scope for "automation" in all types of industrial processes. It was perhaps ironic, in view of the importance of electrical control, that among the numerous papers presented, none dealt with the electricity supply

industry, yet in this field automatic control has been widely applied for many years. The modern power station, for example, uses extensive automatic handling systems for coal and ash, has automatic control of boilers, and utilises supervisory equipment to check the performance of turbines; and remote control and automatic protection of distribution systems are commonplace. In the chemical and oil processing industries also, automation is widely utilised. Yet in all these cases there has been comparatively little excitement or public interest in the development. This is probably bound up with the difference between continuous process control and regulation, which provides little to see in the way of operation, and the more readily appreciated automatic control of machine tools performing successive or simultaneous operations on material objects, with consequent sociological implications. In the electrical and more specialised industries, moreover, automation has been developed to overcome the growing inability of the human operator to fulfil the increasingly complex requirements attendant on technical progress with sufficient accuracy and speed, whereas in the factory the important factor is mainly economic. Among the major stimuli to increased automation are the developments in precision servo mechanisms, remote instrumentation and computation consequent on the war. Nuclear power developments will provide a further field of development due to the requirement for remote control and remote handling of reactors, and radio-active material. Automation is undoubtedly going to increase in the industrial field; but there is still a long way to go before the popular idea of the "push-button" factory can be realised.

EXHIBITION EXTRA

In the last few years, the electrical exhibition that has for long been an important feature of the British Electrical Power Convention and its predecessors has established for itself a new significance. The narrow aim of selling to the delegates is no longer its exclusive purpose, although there is still every reason why all delegates should visit and inspect the stands and demonstrations. What has brought renewed life to the exhibition is the practice of opening it to the general public. Given the Englishman on a seaside holiday, and the weather he is likely to have to endure on occasions, such a free show can hardly fail. This audience is clearly uppermost in the minds of some exhibitors this year and most pay considerable attention to it. Having achieved this success, however, the organisers of the exhibition have taken another step forward. This year, a special feature is being made of electrical catering equipment—and what better venue for this than one of our largest coastal resorts, with its range of all types of hotel and restaurant. It has been complained in recent years, with some justice, that the electrical industry which places so much emphasis on encouraging electrical methods of food preparation at home, treats cooking on the larger scale as something of a poor relation. Such neglect of the potentialities of commercial catering equipment as a load builder is hard to justify. The present special exhibition feature is a step in the right direction, and it gains point from the paper on the future of electrical catering, which is to be presented next Thursday. Some special effort is worth while to ensure that hoteliers and others who may be professionally interested in the exhibits at Brighton are aware of its existence.

NUCLEAR WASTE TO WORK

Britain's Atomic Energy Authority is giving early attention to its own equivalent of the power station ash problem. In the nuclear power station, waste products accumulate in the metal-sheathed uranium fuel elements, and eventually these have to be removed for chemical reprocessing. Intensely radio-active, they are a hazard and a nuisance—but if their radio-activity can be controlled and used, they become an asset. That full use will be made of this counterbalancing advantage is promised by the formation of a new group at the Harwell Research Station. This will work towards making a twofold contribution to the important isotope branch of nuclear energy development. While the fuel elements are awaiting processing, they can be used as radiation sources for various purposes, such as the radiography of metal parts. Once they have been processed, the longer-lived impurities, again strongly radio-active, notably strontium and caesium, may take their place in the lengthening catalogue of isotopes available for changing the physical properties of fabricated materials.

CATCH THEM YOUNG

Electrical engineering is in fierce competition with all other technologies for boys leaving grammar and public schools, and any falling behind in the race for recruitment will inevitably slow down the expansion of the industry before many years are past. Sensibly enough, the electrical industry is tackling this problem co-operatively, and one result of this is an ambitious film, "The Enquiring Mind," which the Institution of Electrical Engineers has sponsored to show the schoolboy the range of interest that a career in engineering can bring. It has been a continued complaint of those making a study of recruitment to the profession, that electrical engineering has not attracted a reasonable share of the best of the school leavers. Conferences with career masters and the like have improved understanding of the opportunities that engineering offers amongst those who advise the boys; now this film is available as a direct approach to the boys, with whom the decision ultimately rests. We review its content elsewhere in this issue. Here it may suffice to say that it lives up to its title in interest and maintains throughout the high standard of presentation to be expected of the I.E.E. A few years ago, such aggressive publicity from the Institution would have seemed impossible. Now it is accepted, timely, and likely to be of the greatest service to the industry.

COMPLAINTS ABOUT ACCOUNTS?

Electricity's advantages over other fuels can have unfortunate effects for the untutored. This thought is occasioned by a story attributed to an official of the Cameroons Development Corporation. On asking one of his native cooks what he thought of a recently installed Belling cooker, the enthusiastic but alarming answer was: "Him very fine fire, boss—him lit two weeks ago and no go out yet."

Meteor

Transformer Temperature Rise

ALLOWING FOR VARYING AMBIENT TEMPERATURES

By H. E. GREEN, B.Sc.(Eng.), A.M.I.E.E.

ONE of the assumptions upon which the conventional heating curve of a transformer is based is that the temperature of the cooling medium is constant.

It is obvious that such an assumption can only very rarely be true. Fig. 1, for instance, shows the diurnal variation of temperature for London from Monday, 10th to Thursday, 13th August, 1953, the figures being taken from Press reports. During this period the ambient temperature varied between 61° F (16·1° C) and 88° F (31·1° C).

Fig. 2, by way of contrast, shows the variation of temperature also for London, from Monday, 25th January to Wednesday, 3rd February, 1954. During this period the ambient temperature varied between 23° F (−5° C) and 37° F (2·8° C).

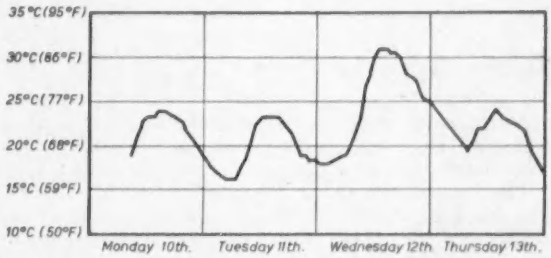

Fig. 1. Diurnal variation of temperature for London from Monday, 10th to Thursday, 13th August, 1953. Note false zero

In order to study the diurnal variation, from a meteorological point of view, the hourly values for each month are averaged over a long period of years. This, it is assumed, eliminates the effects of casual variations. Fig. 3, for instance, shows graphically the figures for Kew for the month of July averaged over the period 1871-1915 (ref. 1).

It will be noticed that this curve has a distinct sinusoidal shape and can, in fact, be reasonably approximated as

$$z = 17 + 3{\cdot}5 \sin (2\pi t/24) \text{ deg. C.} \qquad \text{.....(1)}$$

where t is the time in hours measured from 9 a.m. and the angle is given in radians. Needless to say, curves of ambient temperature cannot always be approximated as sine waves, but this is the simplest approximation and appears to be sufficiently accurate in many cases.

Equation of Cooling

In order to determine how the temperature of a transformer behaves with such a variation of ambient temperature, we may approach the problem in the conventional manner, equating the heat generated to the heat absorbed by the transformer and the heat transferred to the cooling medium. Assuming that the transformer is a homogenous body and that Newton's law of cooling may be applied, we have:

$$W\,dt = mK\,dy + hS\theta\,dt \qquad \text{.....(2)}$$

where W = rate of generation of heat in watts (i.e. sum of iron and copper losses)

t = time in hours

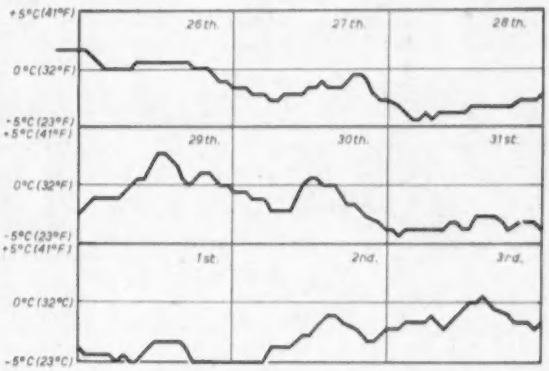

Fig. 2. Diurnal variation of temperature for London from Monday, 25th January, to Wednesday, 3rd February, 1954

m = mass in grams

K = specific heat in watt-hours/°C/gm

y = actual temperature of the transformer in °C

h = heat transfer coefficient in watts/sq metre/°C

S = surface area in sq metres

θ = temperature rise above ambient temperature in °C

putting z = ambient temperature in °C

$= Z + A \sin (pt)$ as in equation 1

where Z = average ambient temperature

and A = amplitude of diurnal variation

we have $\theta = y - z$

$= y - (Z + A \sin pt)$

Substituting this value of θ in equation 2:

$$W\,dt = mK\,dy + hS\,(y - Z - A \sin pt)\,dt \qquad \text{.....(3)}$$

Transformer with Constant Load

If the transformer is supplying a constant load, this equation may be simplified, firstly by assuming that W is constant and then by putting $\tau = mK/hS$ and $\theta_f = W/hS$ where τ is the time constant in hours and θ_f the final temperature rise which the transformer would attain if the ambient temperature were constant.

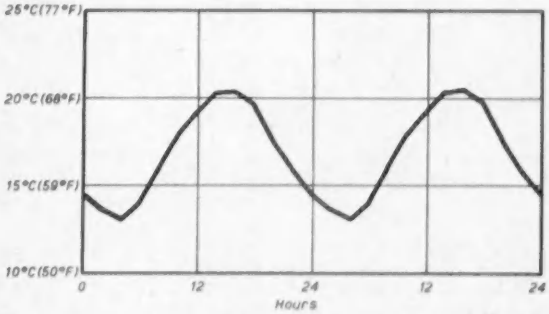

Fig. 3. Average temperatures for a July day at Kew. Note false zero

By simplifying and re-arranging, the following differential equation is obtained:

$$\tau\frac{dy}{dt}+y=\theta_f+Z+A\sin pt \qquad \text{.....(4)}$$

the solution is which is:

$$y=\theta_f+Z+\frac{A}{\sqrt{\tau^2p^2+1}}\sin(pt-\phi) \qquad \text{.....(5)}$$

where $\tan\phi=\tau p$

It is interesting to note that apart from the constant term θ_f+Z, which corresponds to a constant ambient temperature, this equation is similar to that for the current obtained when a sinusoidal voltage is applied to a circuit containing resistance and inductance. In both cases there is a phase angle ϕ.

Table 1 gives the values of ϕ and $\frac{1}{\sqrt{\tau^2p^2+1}}$ for transformers with a time constant of τ of 1 to 5 hours.

Variable Load

In addition to the case of a transformer which is carrying a constant load, it is desirable to consider also the effect of a variable load. This is, however, a more difficult problem since load curves cannot usually be expressed in mathematical form.

Equation 2 may be solved by "step-by-step" arithmetical computation or, as one author (ref. 2) has suggested, by analysing the curves of watts loss and ambient temperature in terms of Fourier series which then enables the equation to be solved mathematically.

TABLE 1. CONSTANTS FOR TRANSFORMER HEATING

τ (hours)	ϕ (hours)	$\frac{1}{\sqrt{\tau^2p^2+1}}$
1	0·98	0·967
2	1·84	0·886
3	2·54	0·786
4	3·09	0·691
5	3·51	0·607

In order to carry out a "step-by-step" calculation, equation 2 must first be put in the form:

$$\frac{W}{W}\theta_f\,dt=\tau dy+(y-z)\,dt$$

where W = loss corresponding to the variable load
W = loss at full load
$\theta_f = W/hS$
$\tau = mK/hS$ (as before)

Inserting the finite differences Δy and Δt instead of the differentials dy and dt and re-arranging, we have:

$$\Delta y=\frac{1}{\tau}\left[\frac{W}{W}\theta_f+z-y\right]\Delta t \qquad \text{.....(6)}$$

Table 2 shows the calculation for a transformer which has a time constant τ of 3 hours and a temperature rise of 50° C (θ_f) at full load with the load curve and ambient temperature as shown in Fig. 4. The resulting temperature of the transformer (y) is also shown in Fig. 4.

The initial temperature (38·3° C) was obtained by a preliminary calculation assuming that the transformer started "cold" 24 hours previously and using the same load curve and ambient temperatures.

The accuracy of the method will, of course, depend upon the time interval (Δt) used. The interval of one hour taken in this example is rather coarse, but probably sufficiently accurate for practical purposes. Further refinements to the method of calculation can be made if desired, e.g. by taking into account the variation of winding resistance and copper loss with temperature and also any variation in the heat transfer coefficient (assumed constant according to Newton's law of cooling).

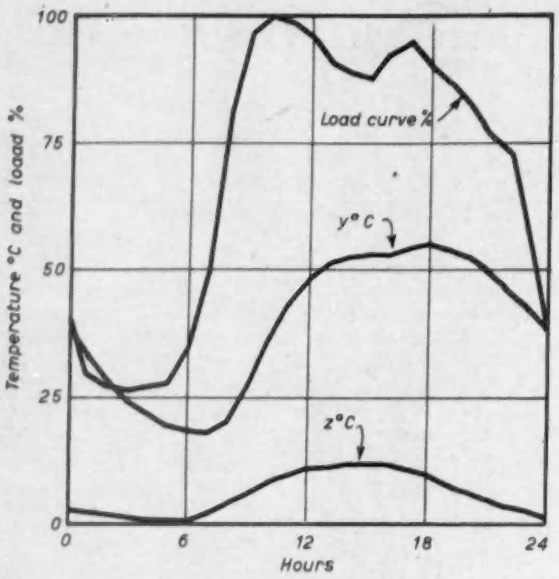

Fig. 4. Transformer temperature curves as calculated in this article. Temperature rise = (y−z) °C

Winter Temperatures

It has already been mentioned that curves of ambient temperature cannot always be approximated as sine waves. In this country, for instance, winter temperatures deviate considerably from the simple sine curve, the time of sunrise and sunset having an important influence. On the other hand the amplitude of the diurnal temperature is less in winter than in summer so that the variation becomes less important. This is illustrated by Figs. 1 and 2. Further information on this point is readily available (ref. 1).

Other Climates

Detailed information regarding the diurnal variation in other climates is difficult to obtain, but even if it were

TABLE 2. TEMPERATURE RISE CALCULATIONS FOR REPRESENTATIVE TRANSFORMER

t hours	Load %	W %	z °C	y °C	Δy °C
0	40	37·0	2·5	38·3	−5·8
1	29	31·3	2·0	32·5	−5·0
2	27	30·5	1·5	27·5	−3·6
3	26	30·1	1·0	23·9	−2·6
4	27	30·5	0·5	21·3	−1·9
5	28	30·9	0·5	19·4	−1·2
6	35	34·2	0·5	18·2	−0·2
7	50	43·8	2·0	18·0	+2·0
8	82	75·4	4·0	20·0	+7·2
9	97	95·6	6·0	27·2	+8·9
10	100	100·0	8·0	36·1	+7·3
11	99	98·5	9·5	43·4	+5·1
12	96	94·1	11·0	48·5	+3·2
13	91	87·1	11·5	51·7	+1·1
14	89	84·4	12·0	52·8	+0·5
15	88	83·1	12·0	53·3	+0·1
16	93	89·9	12·0	53·4	+1·2
17	95	92·7	11·0	54·6	+0·9
18	90	85·8	10·0	55·5	−0·9
19	87	81·8	8·0	54·6	−1·9
20	83	76·7	6·5	52·7	−2·6
21	77	69·5	5·0	50·1	−3·5
22	74	66·1	4·0	46·6	−3·2
23	58	50·2	3·0	43·4	−5·1
24	40	37·0	2·5	38·3	−5·8

not it would be out of place to discuss here all the meteorological and geographical conditions involved. The following two references are, however, of particular interest since they occur in electrical engineering literature with reference to transformers.

For a typical summer day in France with a maximum temperature of 33° C and a minimum of 8° C the curve of ambient temperature was analysed into a fundamental sine wave and second and third harmonics (ref. 2).

Curves have also been given (ref. 3) for Tbilisi (Tiflis) for 14th July, 1936, and 9th October, 1936, in which the diurnal variation of temperature was 18-32° C and 10-23° C respectively. In both cases the curves were approximately sinusoidal.

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Using Reactor Wastes

NEW HARWELL SECTION TO DEVELOP INDUSTRIAL APPLICATIONS

NUCLEAR engineering has a waste product problem similar in many ways to the ash problem of steam engineers. In some ways, however, nuclear wastes are more readily put to profitable use. To develop their application to the fullest extent, a new group has been formed by the U.K. Atomic Energy Authority, with the title "Technical Irradiation Group."

Starting point of the group's work will be the waste products which result from the fission of nuclear materials in reactors. These are contained by the metal cases of the fuel rods, and are normally separated out by chemical processing. An intermediate step is now envisaged. Normally the fuel rods are stored away to allow their radioactivity to decay. In future, they may be used during this "cooling" time as radiation sources, possibly for the irradiation of various substances to produce useful isotopes.

Main purpose of the chemical processing which is the next stage is to separate out the plutonium that has been formed, and such uranium as remains unused. Residual liquors from this work contain the fission products and, generally speaking, these can be concentrated by evaporation. This concentrate can be used as a source of radiation, or individual long-half-life isotopes may be extracted. Caesium 137, a source of gamma rays, is a particularly promising subject for such treatment. It has a half-life of 33 years.

Industrial Applications

The present object is to help industry generally develop the application of this source of radiation, which may be available on a large scale at relatively low cost. A possible electrical use which has received considerable publicity is the treatment of polythene to make it more resistant to heat, and so to permit the uprating of cables in which it may be used as the dielectric. Other examples are the irradiation of germanium to improve its suitability for use in transistors, and the irradiation of silicone rubbers as a means of vulcanisation.

Some applications of electric power may perhaps be modified by developments in applied radioactivity. Pumping in chemical plants is an example. It has been found that processes which require high temperatures and pressures have, when used in conjunction with radiation, taken place under less onerous conditions, with a corresponding saving in plant costs. In addition, by using radiation it has been found possible to produce many plastics which could not be made at all by conventional methods.

Another radiation application on which some work has already been carried out is sterilisation. There seems hope of applying this to foodstuffs, at least to extend their "shelf life" in the absence of refrigeration. The great advantage here is that no high temperatures are needed.

In helping industry develop such techniques, the Technological Irradiation Group will be equipped with very large radiation sources and with particle accelerators, including a linear accelerator. Large scale expansion is expected, and it is possible that the Group may have to move away from Harwell before very long. In the opinion of the head of the Isotope Division at Harwell, it is probable that within the next year, uses will be developed of all the fission products likely to become available in the next 10 years. Sir John Cockcroft, in a recent lecture, estimated that providing the strontium and caesium were separated, disposal of the radioactive waste from nuclear power stations would add only 1 or 2% to the overall cost of their operation.

Although industrial techniques will be developed at Harwell, it is obvious that actual irradiation on a production scale will have to take place at the main factories. Thus in addition to the perfecting of new techniques, it will be necessary for an increasing number of engineers with some knowledge of nuclear and radioactive techniques to be available for employment in industry.

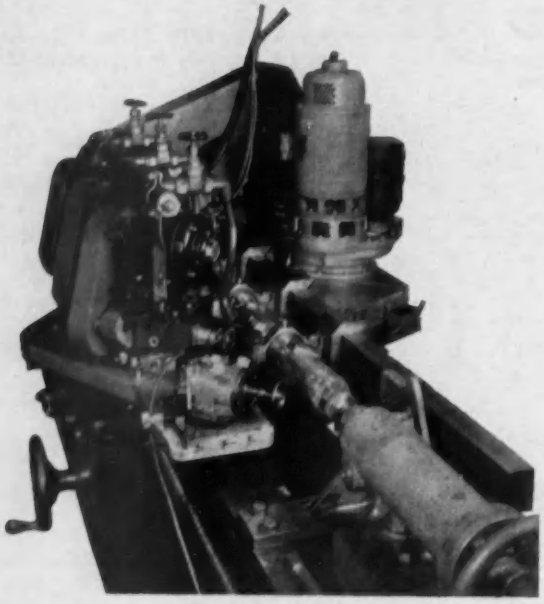
Fission Products

To return again to the production of fission products. These occur from the break-up of the nucleus which constitutes the act of nuclear fission, and gives the heat output which enables a nuclear reactor to be used for steam raising and hence electricity generation.

Consider any one nucleus of U235. It will "split" into nuclei of other elements so that the total mass number remains at about 235. For example, the fission-forcing capture of a neutron might give an unstable compound nucleus of mass number 236. If this emits two neutrons (to continue the chain reaction), then it may also break up into nuclear fragments of total mass 234—one possibility is Krypton 92 and Barium 142. It has been stated that there are about 30 possible ways in which the break up may be made. Most of the fragments are concentrated in two groups, with mass numbers around 90 and 140.

The fission fragments formed may also be unstable. For instance, Krypton 92 decays fairly rapidly to Zirconium 92, and Barium 142 to Cerium 142, both the end products being stable.

Two long-life isotopes occur in the uranium-fuelled reactor. They are caesium 137, already mentioned and strontium 90. This latter isotope has a half-life of 22 years, but compared with caesium suffers from the disadvantage that it is not a gamma-ray emitter, giving out only relatively short-range beta-rays.



Automatic milling of eccentric workpieces (B.T.H.)

The Automatic Factory

PRODUCTION ENGINEERS IN CONFERENCE DISCUSS NEW CONCEPT

OVER the past few years, rapidly increasing interest has developed in the idea of the "automatic factory." This concept, which has grown naturally from the mass production techniques of earlier years, has received a considerable move toward reality by the recent introduction of computers, precise servo mechanisms, and a great variety of electronic devices.

To establish as far as possible the future of automatic factories within the political technological and educational framework of the community, the Institution of Production Engineers last week held a Conference at Margate at which a considerable number of papers were brought up for discussion. The theme of this Conference was most aptly described by its title "The Automatic Factory—What does it Mean?"

General Considerations

The majority of the papers dealt with the subject from one specific aspect, but a most general paper was presented by Mr H. J. Graves of the Austin Motor Co. The motor car industry has, incidentally, recently been cited as in the forefront of "automation" development. Mr Graves quoted Mr Hautau's definition of automation as "the completely automatic manufacture, assembly and preparation of products for shipment, in fact, a push button operated factory." He pointed out, however, that this may be a dream of the future, but that already considerable automation existed in many cases. From rationalising assembly techniques by the use of conveyor systems, the engineer was now rationalising the machining line by bringing together all the tools required to machine a particular unit, with automatic transfer of the unit between one tool and the next and with automatic registration. This technique could use standard machine tools; the engineer's problem was to arrange the correct handling and sequential operation. In Germany, the transfer press had been introduced whereby several press tools on one slide performed successive operations on the workpiece which moved laterally along the bed.

In his view automation had necessarily to develop and increase. The reasons he cited included the need to reduce costs, the shortage of skilled and semi-skilled labour, the need to use tools to maximum capacity, and the requirement to save space. He did not think it wise at the present moment to use complete automation as a breakdown could shut down the whole production line. He suggested that the line should be broken into sections with storage space for components between each section so that there was always a stock available while repairs were being made to any one section.

Human Problems

The introduction of automation will naturally have repercussions well beyond those affecting the workshops. Mr F. Garner of Joseph Lucas Ltd., itemised some of the major problems which confront the management. The way in which automation developed in a works had a significant bearing: in some cases, a complete section could be transferred to automatic working, in others piecemeal introduction was possible. The manager would have to investigate the best method. The approach to the staff on this problem was critical. All needed to be informed and made strong believers. Directors would need convincing and the co-operation of operators sought. Training was, in the majority of cases of first importance, and arrangements made for the recruitment, where necessary, of skilled men. These would include a first-class production engineer, and a product designer, who should be within the executive team from the start (in the chemical and oil industries this man is, of course, unnecessary) together with their staff.

The problems confronting the Board room were dealt with by Mr M. Seaman of the British Oxygen Co., who also emphasised the fundamental importance of creating the right attitude of mind within the company. The whole subject of automation was dominated in the last analysis by the sales rate of change within a community or internationally, as this determined the capital expenditure and the consequent charges. The decision to introduce automation on any scale was consequently a Boardroom one, and in this country was necessarily related to export markets and in turn to overseas development.

The wider problem of the impact of automation on the individual was considered in the paper by Prof B. R. Williams, who after summarising the factors involved in the three answers "yes," "no," and "it depends" to the question of "will the automatic factory lead to the age of harmony, leisure and plenty," came to the conclusion that the development of the fully automatic factory was not imminent due to the enormous problems of cost and sociology involved. He also felt that a pre-requisite of automation was the rapid development of overseas territories to provide an expanding market.

Trade unions will have a great part to play in the development of automation, and their possible reactions were analysed by Mr E. Fletcher, secretary of the T.U.C. Scientific Advisory Committee. In the past, British trades unions had not opposed developments of automatic production and control. Indeed, there was evidence of

welcome in many cases due to the higher wages, higher production and greater safety which could be achieved. Nevertheless, problems of stability of employment, job classification and wage differentials inevitably arose, which might lead to trouble. American experience was interesting but of limited value as a precedent, although the concern felt there at the introduction of automation at an unprecedented but quite undeterminable rate was reflected in the demand for a national investigation of the problem. The U.S. economy, however, was working with a considerable degree of unemployment as compared with this country. Mr Fletcher emphasised that if automation were to lead to more scientists and technologists undertaking management functions the relationship between management and labour would become even worse than it was today. Many scientists were ignorant of the facts of industrial life and tended to be intolerant of other people's opinions.

The greater the rate of change, the greater was the possibility of damage from technological unemployment. From a trade union aspect the big question therefore was the likely rate of introduction of automation. It had been suggested that capital investment might be a limiting factor though there were indications that this had been overrated. While the unions would advocate specific steps to protect members from "technological-unemployment" it seemed likely that government intervention between the two sides of industry would be necessary to speed up the procedure of industrial relationships.

Educational Aspects

Scientific and technological education have been the targets of much controversy in the past decade. From a consideration of the population trends, as Mr C. L. Old showed in his paper, "A Challenge to the Technical College," only by the utmost use of all the powers and skills possessed by the people of this country could we hope to achieve our ambitions. In America, allowing for the difference in size of the labour force nearly three times as many persons of Higher National Certificate standard were employed as in this country.

While the university output of graduates from universities had doubled since the war, this did not apply to 1st class honours graduates and it looked probable that universities had reached their useful limit of expansion. Further expansion would therefore have to take place in the larger and better equipped technical colleges. The biggest contribution from these colleges in terms of numbers was through the Higher National Certificate schemes, but in the light of modern requirements there were two particular weaknesses: (1) lack of physical sciences and insufficient mathematics and (2) lack of breadth within the course of study, with consequent little development of the imagination. There was no present answer to (1) but a partial solution to (2) was being found in courses of management studies provided by some technical colleges.

Mr Old gave some details of the 1954 Ministry of Education Report on "Early Leaving" from schools, and outlined the effect of the recommendations of this report on technological education.

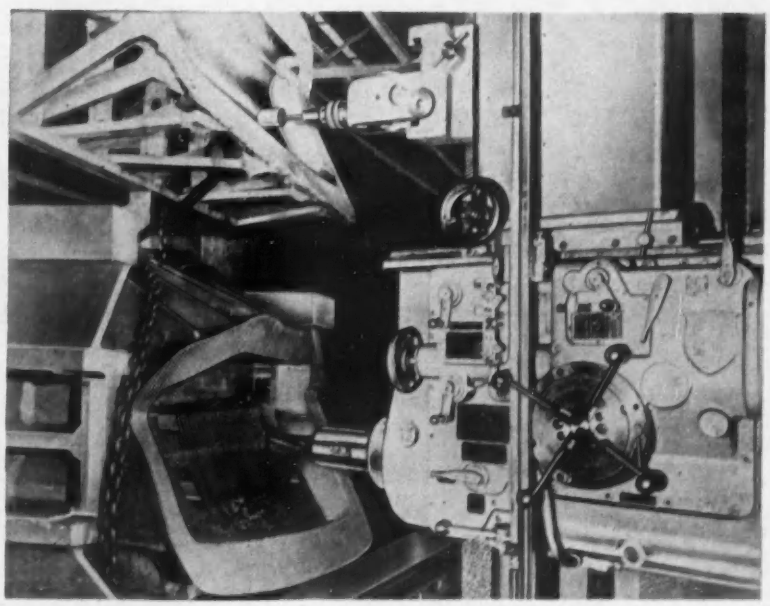
Computers

It is the application of the computer to automation that has aroused the greatest popular interest. Mr Booth of E.M.I. Engineering Development dealt with the control function of computation from a general aspect. He began by taking a simple cam copying system and showed a step by step development from the comparatively simple servo following method using a master plan to the use of coded information on a punched tape fed into an electronic system to control the movements of the tool and table. He also described the principles of analogue computing, and maintained that except for jig borers, it was practicable for analogue computers to be built with an accuracy greater than the machine tools controlled. Analogue computing could be applied to the direct control of the physical process. Digital computing on the other hand could be used to extend this control to the working of the whole factory.

Assuming that many different articles were being manufactured at the same time, and assuming that there was a description of each article in terms of the processes and material required to make it, it should then be possible to use compution for optimum planning and scheduling.

A batch of cards, a day's worth or a week's worth, having been put into the computer, the totals of each class of work and each type of material could be arrived at. The computer "memory" would have up-to-date information of the stock position, and also know the shop capacity under the headings of processing, such as milling, turning, assembly and so on. This information should be maintained up to date by inserting direct information from the machines concerned so that errors in machine time estimates could be detected and amended.

Under this system the shop loader keys in the jobs to be done as they are received from the estimators. The computer then refers to the material stocks and prints out any shortages with average delivery times. If no shortages are present, or delivery dates are short—within the running time of an existing line—the computer takes up the next free line on each class of work and prints a schedule giving the anticipated delivery date of the items



High speed milling of a complex workpiece from a copy (B.T.H.)

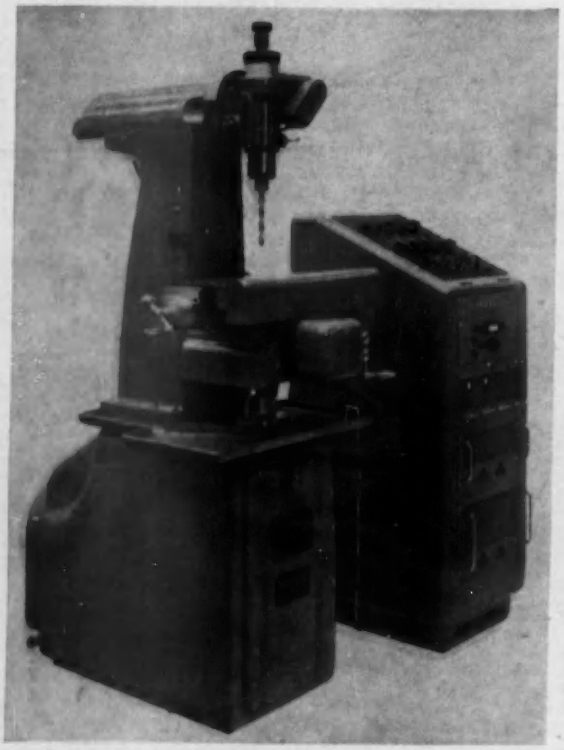
fed in initially on the cards. When this delivery takes place the information is keyed back to the computer, which issues information to the shop for the next item. The computer can also print orders for new raw material, issue stores vouchers and give running costs.

Machine Tool Control

Computer control of machine tools also formed the subject of the paper by Mr D. T. N. Williamson (Ferranti). Here, he described the system whereby a drawing could be converted into a code punched into a tape in terms of the x, y and z co-ordinates. The computer only needed to know the co-ordinates of the points of change and the poles of the curves, and would fill in the gaps automatically. The resultant information was produced in the form of four magnetic tapes of which three gave the x, y and z information, the fourth containing data of the machine control and other functions. By the use of optical gratings attached to the work bed, it was possible to use interferometry to measure displacements continuously to any required degree of accuracy. This method was used to provide the necessary feed-back to the controller which was operating with the magnetic tapes to drive the machine tool movements. Preliminary results indicate that an overall accuracy of ±0·005 in. should be achieved with good quality standard machine tools.

This system was a practical reality and could lead to substantial savings in machine time particularly where complex forms were concerned. A three-dimensional cam for a turbine blade miller taking three weeks to make by present methods could be planned, computed and machined in four hours, without the need for hand finishing.

Mr J. A. Stokes of B.T.H. tackled the problem of electronic control of machine tools particularly from the angle of motor drive control. He began by describing methods of introducing variable speed drives with accurate matching for large machine tools, and then proceeded to problems of automatic positioning. This, he emphasised, is bound up with methods of measurement. The simplest systems used end rods in conjunction with limit switches; this system could be extended by building into the machine a method whereby it could measure its own displacement. A further extension was the use of remote position control using synchros operated by a rack and pinion drive. Another method of measuring was by the use of electromagnetic devices. One system adopted was by utilising a measuring bar consisting of magnetic material with a series of holes bored in it one inch apart, the holes being filled with non-magnetic inserts. This bar was mounted on one portion of the machine—such as the machine table—while the detector head consisting of a differential transformer was carried on a slideway along which it could be driven in either direction by a small electric motor, the slideway being rigidly attached to the body of the machine. The operator's control desk had a set of six dials on which the ordinate dimension could be set up manually, the dimension being displayed as a row of digits to four decimal places. The four dials corresponding to the decimal portion of the dimension operated a set of master synchros which co-operated with a corresponding set geared to the detector head drive. The head was then driven by its motor until those synchros were in alignment, thus positioning the head in accordance with the decimal part of the dimension.



Ferranti automatic setting co-ordinate drilling machine

The two dials displaying the integer portion of the dimension drove a single-master synchro which co-operated with a corresponding synchro on the main lead screw drive gearbox and controlled the power drive until the slide travel was within ¼ in. of its correct position when control of the drive was transferred to the detector head. The positioning process was completed when the poles of the detector head were symmetrically disposed with respect to the nearest hole.

The paper continued by describing tracer control systems for one, two and three dimensions, and concluded by detailing problems which confronted the machine tool designer when automatic control systems were required.

Office Management

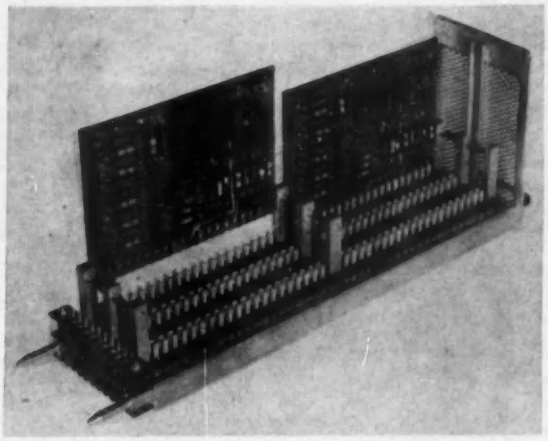
Although automation is primarily directed to the factory it has, in addition, a function to perform in the office. In this field it is necessarily based on the computer. Mr D. W. Hooper (National Coal Board) presented a paper on the function of computers as an aid to accountancy and data processing. The universal computer, he thought, was too large for office routine work; something simpler was required without a large amount of unused internal storage. However, the computer had a facility of selection of significant results and it was this facility which might well open a new concept of management. He gave an indication of the principal figure processing operations of the "electronic office" including analysis of costs and labour, and consequent rate adjustment, individual wage calculations including income tax deduction, stores accounting, invoicing, commission and selling analysis, capital investment and depreciation and even filing. He also envisaged a possible extension to works control based on the computer data.

The present cost of a computer for office work naturally depended on the size of the business concerned and might vary between limits of £15,000 to £150,000. To operate such a machine to best advantage would need a new breed of executive, something of an accountant, a mathematician, a scientist and production engineer in addition to possessing some business knowledge particular to the individual concern.

Present State of Automation

Some examples of present automatic processing as applied to specific industries were given in other papers. Mr P. Bozier, of the Renault Co., described some of the automatic transfer machines that had been developed for car production, and gave the background of the design and installation of these machines, many of which are products of the Renault Co. Mr I. McCallum (Fawley Refinery, Esso) considered the position of automatic control and operation in the oil refining industry. Messrs J. A. Sargrove and P. Huggins took as their subject the special facet of automatic inspection and correction of mass produced items. Weighing and conveying by remote control was dealt with by Mr P. J. Bourgeois (Oerlikon) and the impact of automatic control on the chemical factory was investigated by Mr A. J. Young (I.C.I.).

Finally, among the main papers, was one by Messrs J. A. Hunt and J. B. Jay, on automatic linking devices, particularly those using compressed air, and one by Mr A. G. Peacock on measurement of level and thickness using nucleonic methods.



An example of computer building technique showing the rear view of a plug-in "tray" containing six "circuit cards"

Two additional papers were presented at the plenary sessions. One by Mr F. G. Woollard giving a general survey of the social implications and the other by The Earl of Halsbury dealing with technical and human problems.

Mr Woollard, who for many years has been concerned with the development of flow production methods in the automobile industry, gave the advantages of automation as (*a*) saving in direct labour; (*b*) economy in floor space; (*c*) lower inventory of work in progress; (*d*) greater control of processing; (*e*) cheaper operating heads on the machines; (*f*) automatic inspection of the workpiece and (*g*) much fuller utilisation of machine capacity. It was this last advantage that was the most important. Over the past century the effectiveness of cutting tools had increased phenomenally, but little had been done to expedite the loading and unloading of the workpieces into machines. Now, with automation this part of the operation was as near 100% efficient as it was ever likely to be.

He did not consider that automation would develop in this country so quickly as to cause an acute unemployment problem, but there might be some displacement of personnel which the automated factory might not be able to absorb. He thought, however, that with the aid of automation we should enter a new phase of fine living.

The Earl of Halsbury gave an historic survey of the background of automation. There were, in his concept, four component factors—transfer machining, control engineering, communication engineering and mechanical assembly. The first and fourth might eliminate muscles only, the second and third eliminated nerves and brains. The most human problem was that of the one toiling man left over after the factory has been automised. Technology would appear to leave us with a cross-grained minority of those on whom the world's residual drudgery would fall, with a majority of engineers, administrators, scientists and artists. Thus, insofar as automation would upgrade some and pass others by, it would be to that extent a factor making for disunity in the community.

F.B.I. VIEWS ON MONOPOLIES

SERIOUS harm can be done to productive industry and the national economy if statutory action is based on some of the sweeping generalisations that have been made about monopolies and restrictive practices recently. That is the opinion of the Federation of British Industries which, in consequence, has issued a statement under the title "Restrictive Practices and the Public Interest," aimed at permitting better understanding of the Federation's viewpoint in this matter. The statement particularly attacks the tendency to measure the "public interest" by the test of immediate cheapness to the consumer. This is felt to leave out of account the national interest in strengthening industry to enable it to hold its own in competition, especially in the all-important export trade.

In the Federation's view, the consumer's interest in the long run is best served by his paying a price which enables the producer to operate at maximum efficiency to offer dependable quality and service, and to take advantage of new and improved methods of production. Business conditions that are too highly competitive may not leave enough money for improvements in capital equipment necessary to bring about advances in production technique, nor will they give the incentive to risk money in such ventures.

Dealing with restrictive practices, the statement presents the opinion that agreements between firms may be particularly effective in making possible co-operative research and the exchange of technical information, and may help to create an atmosphere of confidence which is necessary for expansion and greater efficiency.

On the narrower subject of re-sale price maintenance, it is stated that although price fixing may limit price competition in distribution, it has the effect of encouraging competition in the quality of the service rendered, in delivery and in salesmanship. Considered over a long period it may not result in higher prices to the consumer, as prices are kept down in times of scarcity. Indeed, distributive margins on branded and price-maintained goods, which have a steady turnover, are often lower than comparable goods not so protected. Objection is often taken to the measures use to enforce agreements, such as collective boycott and exclusive dealing. However, these are seen as indispensable safeguards to a system of ordered trade by those who used them. Here again, generalisation is most dangerous. It is the way in which the practice operates that matters.

To summarise the statement, it holds that sweeping generalisation in this field is out of place, and that any action which does not have due regard to the particular circumstances of particular cases must react to the detriment alike of producers and traders and their workpeople, of consumers and of the national interest.

The statement is obtainable in booklet form, price 1s. 3d., from the F.B.I., 21 Tothill Street, London, S.W.1.

READERS' VIEWS

Correspondents writing under a pseudonym are asked to submit their names in confidence to the Editor

Domestic Wiring Installations

I WOULD like to make a few remarks regarding the solution to the problem of ensuring that a domestic electrical installation is maintained in a "safe condition," i.e. there is no likelihood of fire or accident. This implies that the installation is inspected periodically and kept in strict compliance with the Wiring Regulations as laid down by The Institution of Electrical Engineers. Your correspondent "Rewiring" of Hampstead, states that the solution to this problem is not easy to find, and that this situation will need to be faced squarely in the near future. I, personally, wholeheartedly agree with his remarks but at the same time feel that there is a fairly easy solution to this important problem. Most people are aware that many accidents or fires which occur within the home come from electrical installations. With this vital fact in mind, I say—as I have said before—that the notice of Regulation 4 (12th edition 1950) I.E.E. Regulation: "Important—The installation should be periodically inspected and tested and a report on its condition obtained, as prescribed in the Regulations for the Electrical Equipment of Buildings issued by The Institution of Electrical Engineers," is a "must." It is very much more important today than it was 15 to 20 years ago, as the number of users (sum total) has greatly increased, as has also the number of electrical appliances, used in the home and factory. I feel that this testing should also be accepted as mandatory.

From this point it could be carried out by the Electricity Boards, Insurance Companies, and Consumers. If co-operation of the consumer was not forthcoming, the Electricity Board concerned should have the authority to enforce the regulation or to disconnect the supply until the necessary inspection had been carried out.

J. H. Robinson,
THORNTON, FIFE

Wiring in Australia

YOUR article on "Wiring in Australia" in the 10th March issue of the ELECTRICAL TIMES is in some respects rather misleading as to conditions in Australia and we feel, therefore, it should not go unchallenged. Different standards always appear strange to anyone who has been used to another set of rules but generally these have been evolved over years of practice to suit particular local conditions. No doubt an Australian inspector transferred to England would equally consider your rules to include some strange practices merely because he was unused to them.

With regard to general purpose outlets the S.A.A. Wiring Rules allow up to fifteen of these to be wired to one final subcircuit of specified wire size. The only State in Australia which does not fully subscribe to this practice is Victoria and the local rules there have recently been amended to allow this number provided that at least two such subcircuits are connected and that the lounge room and kitchen are wired on different circuits. The maximum rating of any G.P.O. is 10 amps so that the largest appliance of any kind that can be connected to such a circuit is, therefore, 2·4 kW. It must be remembered also that such a circuit is protected by a 15 amp fuse which prevents damage from overloading. This diversity has proved satisfactory over many years of operation and experiment. The situation envisaged by your correspondent just doesn't occur.

It is with respect to switchboards that we must most strongly disagree. Admittedly there are still many crude forms of switchboard employed in Australia. In Queensland a wood surround with a hinged front and zelemite or Sindanyo panel is the general type used. In N.S.W. a metal surround and hinged zelemite panel is almost standard practice. In Victoria a wooden surround with fixed zelemite panel is employed and the other States generally follow one of these variations. Wherever a wooden surround is used it must be lined with a non-ignitable material. Asbestos cement is the most common.

In N.S.W. in particular there are several reputable manufacturers making the type of switchboard panel and surround described by your correspondent. These may or may not include a meter panel depending on the requirements of the local supply authority. Some supply their own panels and others require the consumer to provide space for the meters. The form of meter panel required also depends upon the particular locality. In addition to the above there are at least two manufacturers, of which we are one, making complete preassembled and wired switchboards of a standardised design. We manufacture twenty-two different types which are sold throughout Australia. They consist of a metal case in which the required switches and fuses are mounted and wired.

We do not agree that Australian switchgear is of crude design. There are several manufacturers making switchgear to suit local conditions and designed to pass the exacting requirements of Australian Standard Specifications. These follow closely the relevant British Standards and are in some respects, more stringent. This switchgear is of modern design and compares favourably with anything in its class elsewhere available.

With regard to earthing, there is a great deal of controversy here as well as in other countries as to whether the M.E.N. or earth leakage system gives the best protection. As elsewhere, the M.E.N. system is favoured mostly because of cost and reliability. However, there is one large area where the earth leakage system is used extensively, namely the Sydney Metropolitan area and other areas where it is used with discrimination when its advantages give more reliable protection.

In conclusion we would like to point out that the manufacturers' position in this country is made more difficult by the different standards applying, not only in the different States, but also in different areas within the one State. In the Sydney Metropolitan Area alone there is now only one Generating Authority but there are approximately ten different distributing authorities each with its own set of wiring practices, all based on the S.A.A. wiring rules. This was brought about originally by the vesting of the distribution rights in the local Municipal Councils. There is at present a serious move to combine some of these areas to simplify distribution problems. The differences between States are even more marked than those in local areas, and in addition a relatively small overall population makes it difficult for the local manufacturer to produce standardised products in sufficient quantity to become economical.

J. Van Dyck,
General Manager,
The Scanlan Electric Co., Ltd.,
MASCOT, N.S.W., AUSTRALIA.

PREPAYMENT METERS

Modern requirements demand flexible payment systems

By J. PRINCE, M.I.E.E.*

IN the early 1930's many domestic users of electricity paid for energy by means of prepayment meters, their financial affairs being such that they preferred to pay immediately for all requirements. Monthly or three-monthly bills were a burden and the prepayment of money for electrical energy suited the people who were only comfortable when they paid their way immediately. The use of this type of meter was rapidly expanding, but in the year 1939 the demand was abruptly reduced.

The purchasing power of money from 1930 to 1937 was only changing relatively slowly, but with the advent of war inflation became rapid. Many types of meters had facilities for changing the price of the electrical energy unit by means of change wheels or geared compounds. One type working in units/coin, the reciprocal of price/unit, had means for external change. In a rapidly changing economy it became clear that easier facilities for price changes would be an advantage, especially if the changes could be made on site. This applied to any type of prepayment meter.

Factors Affecting Design

Other factors have arisen which react on the design or the usage of coin freed meters. A few are: (1) the 1936 Meters Act; (2) The nationalisation of the electricity supply industry; (3) The issue of B.S. 37: Pt. 3:1953—a new specification for prepayment meters; (4) Annual purchase rates of prepayment meters (a ban was applied to the purchase of this class of meter during the war years); and (5) Consumer Prosperity. During the war and the immediate post-war period, monthly or three-monthly bills were no longer a burden, but at the present time requests are again being made for prepayment meters.

A schematic layout showing the principles underlying one class of meter which was in considerable use in the early years mentioned is shown in Fig. 2. By changing the price/unit change compound, or the wheels fitted to this system, the price/unit could be altered from ½d. to 3s. in extremely small steps. This type of meter could also be arranged to collect money with respect to time by interposing another unit consisting of a time-controlled motor fitted with reduction gearing between the price change compound and the tripping differential, and the scheme became that of Fig. 3.

*The author is with Ferranti Ltd.

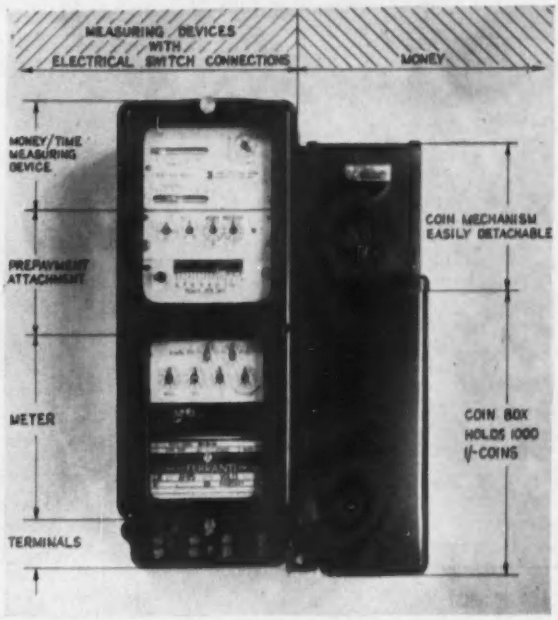


Fig. 1. Layout of the Type FMP meter, presenting a compact and pleasing appearance. An alternative meter front conceals the money/time and prepayment attachments apart from a small panel showing the "units unused" and "money inserted" dials and a small flap gives access to the pence/unit change lever

In this particular arrangement, where the price change device is internal, the gear movement can be proportional to "electrical energy" or "money values" depending on the position. If the price change compound is positioned as in Figs. 1 and 2 it can be seen that major changes of gearing (or price/unit) will change the load between the meter and the switch trip. With the advent of the Meters Act of 1936 however, the emphasis on meter accuracy became more pronounced and design had to consider making all price adjustments, both minor and major, in such a way that the load on the meter acting to the position of switch trip never changed.

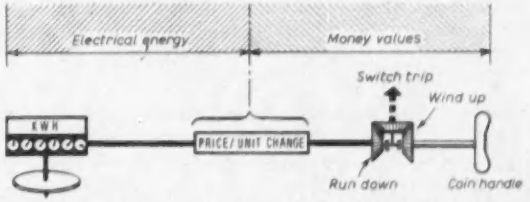


Fig. 2. Early prepayment system employing a price/unit change mechanism. Variation of the latter altered the load on the meter

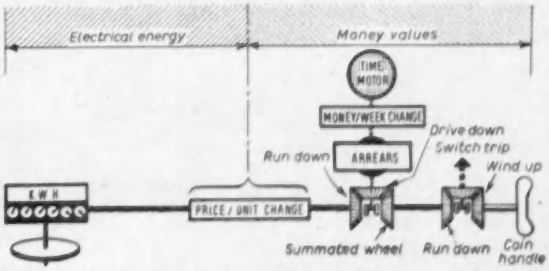


Fig. 3. The early system shown in Fig 2 is here seen arranged also to collect money on a time basis, using time motor driven gearing

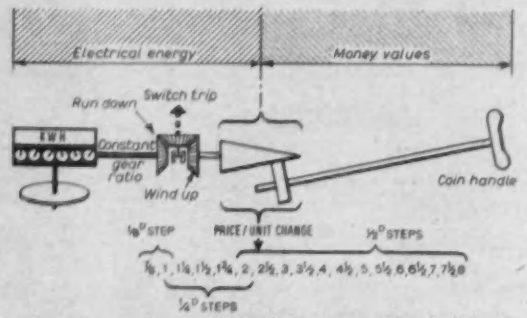


Fig. 4. Basic prepayment meter of modern design (c.f. Fig 2). It is seen that the price/unit change mechanism is now remote from the meter

Another important factor is that under the nationalisation of the Supply Industry the variety of tariffs and charges has been considerably reduced and a more compact range of prices/unit are now needed than was the case previously. This trend may progressively improve and further standardisation of tariffs may take place; consequently prepayment design has been, and will continue to be, considerably influenced.

With the current increase in generation equipment, the need for the restriction of unit sales to domestic consumers has disappeared, and, in contrast, every effort is now being made to increase such sales. As a result of these conditions the number of householders extending their use of electricity is likely to increase, and, despite the reimposition of hire purchase restrictions, a considerable use will continue to be made of hire purchase for this purpose.

Hire Purchase Arrangements

Hire purchase charges of apparatus can be incorporated in some types of prepayment meters either in the initial stages of manufacture, or at some later date. A meter of the type that will collect money with respect to time, in addition to the units charge, can be arranged to collect on a 2-part tariff basis, a hire purchase basis, or a rental basis, either separately or collectively. The problem is incorporating this important feature on a meter employing a simple basic design of electric unit charge device, which takes into account the various requirements mentioned above. A schematic view of such a basic meter is shown in Fig. 4.

It can be seen that all changes of price/unit can be made without altering the gearing between the meter and the switch trip position. The load between the meter and the switch trip position thus remains constant, although the gear ratio between the differential and the coin handle is changed, but this altered loading is easily overcome by manual power. If the change compound is inside the meter case, then the gear between this change and the coin handle is moved proportionally to money values. If the "change" device is external to the meter case then all values inside the meter are proportional to electrical units and the changes are carried out in units/coin, the reciprocal of the price/unit, and the collection of money on a time basis is difficult to arrange. In the former method (change facility inside case) the additional features of 2-part tariff, hire purchase, or rental charges can also be accomplished, as can be seen in Fig. 5.

This schematic arrangement obviously meets the necessary conditions of good meter practice, and has the advantage of great simplicity in its standard form, but with the added facility that money/time collections can be incorporated. In fact, this method is so flexible that the money/time collection can be carried out without the meter device, and the scheme becomes that of Fig. 5. In this example, the meter element would be removed and connections made from the switch terminals direct to the terminal block.

TABLE I CHANGES IN ACCURACY BETWEEN THE 1937 AND 1953 EDITIONS OF B.S. 37 FOR PREPAYMENT METERS.

Power factor	B.S.37: 1937	B.S.37: Part 3: 1953
Unity	Limits of error ±2% from 10% to 125% of load current. Limits of error ±3% at 5% load current. (For long range meters, limits of error ±2% from 200% to 125% marked current.)	Limits of error +2%, −3% from 1/30 marked current up to and including marked current.
0·5 lag	Limits of error ±2% from 125% to 20% of load current. Limits of error ±3·5% at 10% of load current. (For long range meters, limits of error ±2·5% from 200% to 125% marked current.)	Limits of error +2%, −3·5% from 1/15 marked current up to and including marked current.

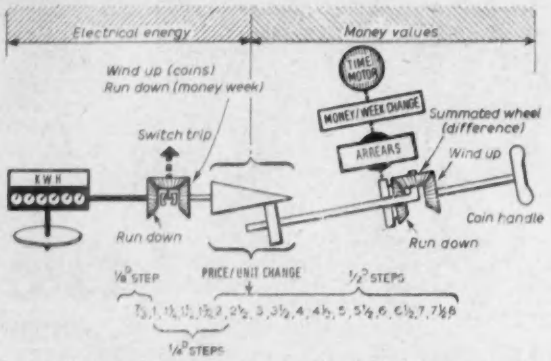


Fig. 5. Modern prepayment meter with additional mechanism to collect money with respect to time for rental or hire purchase purposes or to incorporate a two-part tariff

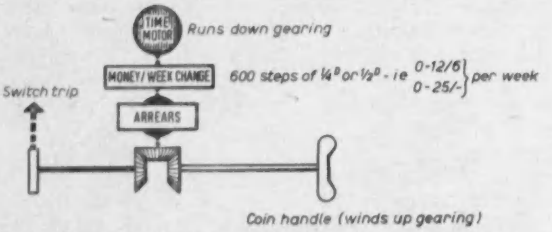

TIME MOTOR
Runs down gearing
MONEY/WEEK CHANGE
600 steps of 1/4D or 1/2D - ie 0-12/6 / 0-25/- per week
Switch trip
ARREARS
Coin handle (winds up gearing)

Fig. 6. The money/time device itself can be used separately without any energy measurement being required

Demand for Prepayment Meters

Prepayment design projects have been slowed down by the dramatic fall in demand during the war years. Purchases of these meters were down by 11 to 1 as against the 1937/38 requirements. Even in the post-war years requirements have only been 25% of the immediate pre-war years. This slowing down of purchases coincides with the greater prosperity of the consumer, with whom three-monthly billing was not at that time a great inconvenience. As pointed out earlier however, a change is taking place in the outlook of certain consumers, who are beginning to request a device which allows for immediate

payment or even prepayment of accounts. Any worsening of the country's economic condition will hasten this demand.

In 1953, B.S. 37: Pt.3 was issued, this being the first time that prepayment meters have been governed by a completely separate specification. The practices laid down by this specification are concise, sensible, and will influence all design trends. Two particular points of interest are noteworthy. (*a*) The change in ratings from the long range (B.S. 37:1937) to the maximum current rating (B.S. 37:Pt.3:1953). The ratings will, some time in the future, be 10 amp and 40 amp m.c.r. (*b*) Changes in accuracy levels regarding prepayment meters, between the 1937 and 1953 specifications. These are shown in Table 1. A significant change in the new specification with relation to B.S. 37: 1937 is that the overall effective measuring range of the meter has been altered and moved bodily along the load curve.

A meter known as the type FMP and incorporating many of the features mentioned above, is shown in Fig. 1 and the remainder of the article is devoted to a description of these features. The meter element is the well known FM type, having long range ratings until the relevant clauses of B.S. 37: Pt 3:1953 on m.c.r. ratings become operative.

Case Fitments

The electrical energy and time measuring devices, together with the switch and the electrical connections, are fitted in a separately sealed, insulated compartment on to which are fixed the money devices. The coin actuated system and the coin box are both externally mounted and they can easily be removed (if necessary on site) from the meter case without the need of tools (other than opening the cash box lock), or without breaking the meter seals.

The coin actuated mechanism, probably the most highly mechanically stressed device in the meter, reflects preference now given to the single coin device, of the 1s.

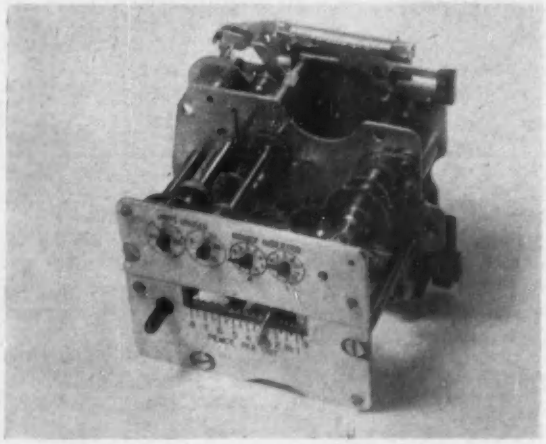
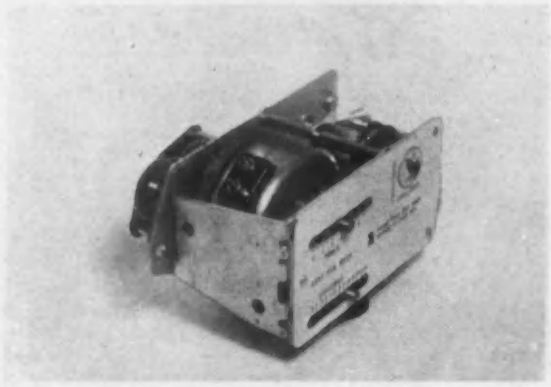

Automatic locking device
Drive from meter
Storage spring
Switch control cam
9 7 6 5 4 3 2 1 0
PRICE UNIT CHANGE
Drive from coin mech.
Drive to money/time unit, when required
Switch closing device operated by coin mech.
100 amp switch closed position
Spring (60 lbs/sq.in.)

Fig. 7. Prepayment mechanism of the FMP meter—the conical gear system can just be seen behind the front panel. Below is shown a diagrammatic representation of the switch and tripping system



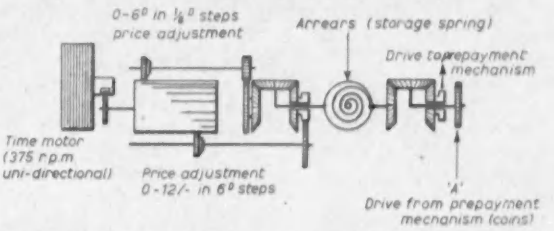

0-6d in ½d steps price adjustment
Arrears (storage spring)
Drive to prepayment mechanism
Time motor (375 r.p.m. uni-directional)
Price adjustment 0-12/- in 6d steps
'A'
Drive from prepayment mechanism (coins)

Fig. 8. Time/money measuring system used in the FMP meter with, below, the gear trains involved shown diagrammatically

denomination. It has been found advantageous to omit the special full credit coin slot closing device, which usually is only called upon to operate on a few isolated occasions. The prepayment reservoir is sufficient to purchase 360 units in advance, whilst the coin box itself holds 1,000 coins, to ensure that in almost all cases, the jamming of meters due to the coin box being full, is eliminated.

In view of the likelihood of promoted consumption in domestic premises, particularly those fitted with prepayment meters, the switch must be capable of rupturing high currents at supply voltage. A short break (0·010 in.) deionising switch with heavy duty copper contacts is therefore employed, and it successfully interrupts currents of the order of 100 amp at 240 V a.c. supply. The contacts are closed by a double toggle system to create a pressure of 60 lbs/sq. in. at the faces and are designed to trip with a dead centre action requiring only fractional effort.

Prepayment Attachment

The prepayment attachment (Fig. 7) contains the switch, toggle, and tripping system together with the differential, which is actuated both by the coin and the meter mechanisms. It also incorporates the price/unit change device, which is arranged as shown earlier in Fig. 4. The price/unit is changed by merely moving the lever manually to the required price, access being gained through a small dust-proof transparent door. An automatic locking and unlocking device is actuated when the door is opened and closed, to prevent the mechanism running down, with consequent loss of the existing credit, during the motion of price change.

The money/time device (shown in Fig. 8) comprises a hysteresis-type unidirectional synchronous motor running at 375 r.p.m. which drives a gear change unit to alter the ratio in 600 finely divided steps. Standard prices range from 0 to 12s. 6d./week in ¼d. steps, or from 0 to 25s./week in ½d. steps, but other arrangements can be made. The unit can be fitted to the prepayment meter during the initital manufacture or at some later date, the orthodox prepayment attachment having facilities for its incorporation as a completely separate item.

around the trade

by Peregrin

AT the recent E.C.A. Conference, Mr C. C. Worters' paper was a welcome change from the usual run of papers on technical topics or trade politics. Hire-purchase is an important factor in the electrical and almost every other trade at the present time, though many of us do not realise it, as was evident by the sporadic yawning during the paper and discussion. Yawns which certainly were not prompted by any lack of ability on the part of the lecturer.

Mr. Worters could be excused a bias in favour of hire-purchase, but he showed no such bias, indeed he strongly emphasised that hire-purchase should be only a last resort when cash down cannot be found. Sound advice that. If persuasion has to be used, the salesman should always dwell upon the blessings of cash before he dilates on the benefits of credit. Retailers should also draw a firm line between cash and credit. When a customer does not favour hire-purchase, but promises to pay a bit now and a pound or so now and again until the account is cleared, have nothing to do with it.

Enquiring round the trade since the Conference, I find disagreement with one casual statement in the paper. Mr Worters declared that it is not difficult today to find a finance house willing to act. I am told it is very difficult. Finance houses, however willing, are mostly full up with business to the limit of their capital, and indications are that the Chancellor's frown on the use of capital for this purpose will deepen a long time before it breaks into a smile. Many dealers are looking anxiously at the calendar and remarking that if credit facilities are scarce in June what will things be like when they really get busy in a month or two.

Several retailers, who seem to have studied this hire-purchase business, object to Mr Worters' term "deposit." They contend that the payment made by the client on signing the agreement is not a deposit as usually understood, but a first payment towards the rent comprising the total hire-purchase price. It may be a small point, but these knowledgeable dealers carefully shun the word "deposit" as they do the term "interest," a word also avoided by Mr Worters.

Look to Appearance

The combined papers on "Sales Promotion" must have sent many contractors hurrying home from Margate to have a look at their letterpaper and cast a critical eye on their vans. Some of my contractor friends have since admitted that although most of the points in the paper were obvious and by no means new, the paper had made a deep impression on them. Those signboards outside jobs for instance. However generous cable makers may be, the passer-by is not really interested in the make of cable being used, but he does not mind knowing who is doing the electrical work, if he can find the name and address without straining his eyes. But that mode of free advertisement is passing. On big jobs the electrical man has to queue with the other sub-contractors to have his name included in a vast impersonal list, probably read only by his competitors to find out who got the job, but charged for by the main contractor just the same.

And those vans. A contractor friend, after Margate, asked me to comment on his. I commented and criticised. The vans were in good condition, smartly painted and not too untidy, but on the back was merely the advice "For prompt and efficient service, phone CEN 4569." Nothing more. A motorist could follow a van for miles, until he hated the sight of it, yet never discover the name, address and occupation of the firm offering this matchless service.

But to my mind the one outstanding point in the paper, and one often neglected, is the selection of the man on the spot. Never mind about the letterpaper and vans. What kind of man is sent to do the job and represent the firm? Very often the firm is judged by the appearance and conduct of the operative, and the customer thus influenced with regard to placing future work. Generally a customer, especially a woman, will put up with a lot and pay cheerfully at the end, if the workmen are polite, clean and well-conducted. A man who arrives late, in dirty overalls, cannot be civil, and leaves a trail of cigarette ends and plaster bits behind him, may be the better electrician. He probably does the job much better and in half the time, but he will get no credit for his speed and efficiency, nor will his employer. Only criticism and resentment, and "Don't send that man here again."

Customer's Week

There were some wry smiles among electrical contractors when they were recommended for a 5-day week, at the E.T.U. Conference. Most of them are all for it already. When the 5-day week was introduced after the war, E.C.A. members looked forward to abolishing Saturday morning, which for years had been just an odd-job morning. Too late in the week to start a job and not always convenient to finish one. Even if they could not enjoy the luxury of a full Saturday off themselves, they could at least dispose of that delayed office work and get the place tidied up, while the men were away.

But their industrial customers had other ideas. Saturday morning, it soon appeared, with the factory shut down, was just the time for maintenance work, or the odd bit of wiring or to install the new machine which arrived during the week, and so it has been ever since. Saturday is now a very full and important day, and contractors will never get released from it.

Overtime would not be the solution. Human nature being what it is, a man will cheerfully work on Saturday if it is part of his normal week, but when it becomes an extra day he is inclined to claim the right to please himself whether or not he works, and, especially in the Summer, there are many pleasant week-ends when he understandably decides he has had enough by Friday night. The 5-day week is something to aim for, and it is not the electrical contractors, but their exacting customers, who need to be converted.

NEW SWITCHGEAR FOR 11 kV

NEW J. AND P. OIL-SWITCH AND CIRCUIT-BREAKER DEVELOPMENTS

THERE is a growing demand from the supply industry for oil-switches which will be capable of making on to a fault without damage. To fulfil this requirement, Johnson and Phillips have designed a new switch, type YP, which they are showing at this year's B.E.P.C. exhibition. The switch has been designed for service voltages up to 11 kV with rated normal current of 400 amps and for system fault capacities of 75 MVA at 3·3 kV, 150 MVA at 6·6 kV and 250 MVA at 11 kV. The type tests embodied in the draft B.S.S. CR(ELE) 2023 have been successfully carried out. These include breaking tests at 30 and 130% of rated current and making capacity tests at 33,400 peak amps at 11 kV on the main busbar and internal earthing contacts.

The switch is of the single break design, and is available with either air insulated or compound-filled busbars. It is usually applied to ring main units in which the isolator is incorporated for the control of the ring main, while a circuit-breaker controls the outgoing or tee-off circuit.

The switch is essentially a "two position" switch, i.e. "on" to "off" to "earth." Its operating mechanism is so arranged that it is impossible to pass from the "on" position through to "earth," or vice versa, with one movement of the operating handle. The operating handle must first be located for the operation of the switch from "on" to "off." It must then be repositioned before the switch can be moved from "off" to "earth."

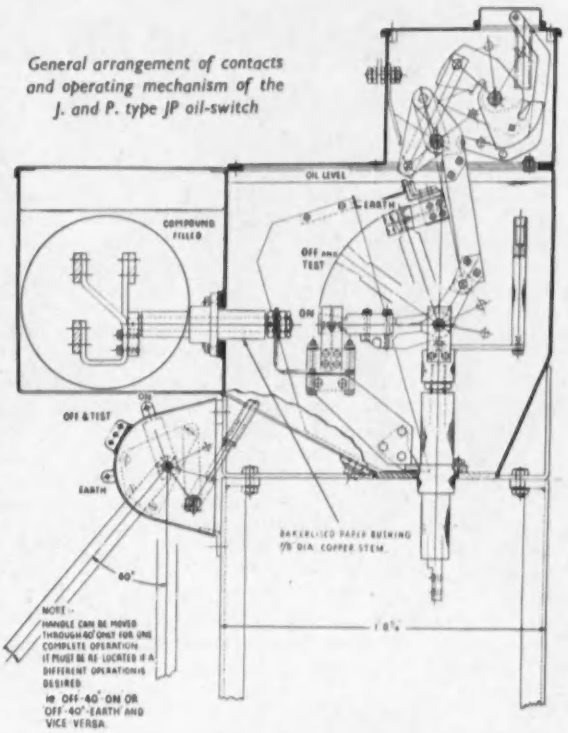
Provision is made for testing the mains cable and a testing device of special design is supplied. This device consists of three testing plugs mounted together on an insulating support plate, which also carries two interlock posts. The testing device is so arranged that all three plugs can only be inserted into the test orifices of the switch at one and the same time.

Contact design for both the busbars and earthing contacts follows the practice adopted in J. and P. oil circuit-breakers. The high-pressure line contacts are of the wedge and finger type. The moving blades are of hard-drawn bar section copper. They have been suitably profiled so that contact is made simultaneously on all four of the fixed contact fingers. Insulating barriers are provided between phases. Cable box filling may be carried out from the front of the unit if necessary and a removable cover shields the filling spout.

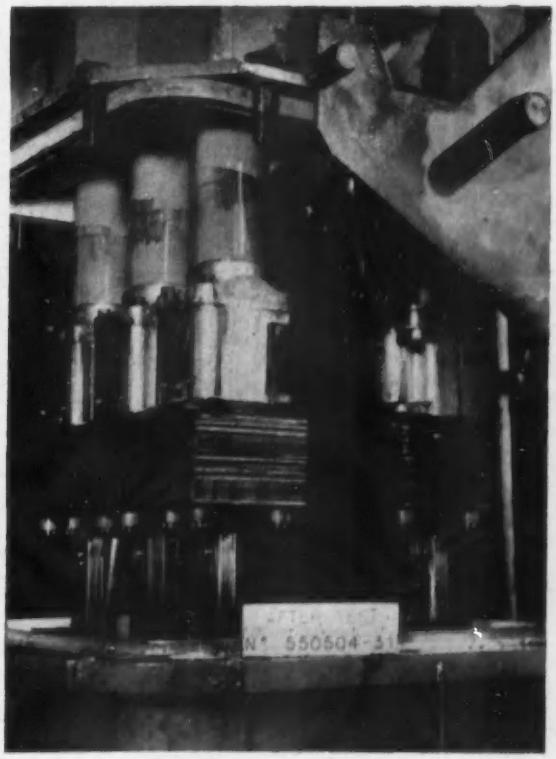
J. and P. have also a new oil circuit-breaker for ratings of 800, 1,200 and 1,600 amperes. This is of the vertical isolation pattern and is for use with type AG 20 air insulated or type FG 20 compound metalclad switchgear. The breaker has been successfully short-circuit tested for rupturing capacities of 150 MVA at 3·3 and 6·6 kV (plain break) and 250 MVA at 6·6 and 11 kV, 350 MVA at 6·6 and 11 kV and 500 MVA at 11 kV.

For the 800, 1,200 and 1,600 amp plain break circuit-breaker, fixed contacts are arranged in multiple pairs according to the current rating. The contacts are of the high pressure live wedge and finger type. Arcing tips and fingers are fitted which are easily replaceable.

When arc control is fitted, additional shunt contacts are used, external to the cross jet assembly, for the 1,200 and 1,600 amp ratings. These shunt contacts do not take part in the breaking operation. The breaker has carried, on test, 30,600 amps for 3 secs. without damage to contacts. Spring or solenoid closing mechanisms can be fitted, and all mechanisms are interchangeable.



General arrangement of contacts and operating mechanism of the J. and P. type JP oil-switch



Arrangement of contacts and arc control devices shown after testing

WIND POWER IN THE ORKNEYS

The 100 kW Aero generator at Costa Head

THE world's most powerful wind generator is now operating at Costa Head, in Orkney Island. This 100 kW project was designed by John Brown for the North of Scotland Hydro-Electric Board, and feeds into the local network which is normally supplied by diesel-engined generators. Costa Head was selected as being one of the most windy places in the British Isles, with gales which frequently attain well over 100 m.p.h. Full power can be obtained from the plant with a wind velocity of 35 m.p.h.

The windmill consists of a steel tower of such height that the centre of the rotor is 78 ft above the ground. On the top of the tower is mounted a nacelle which carries the rotor with its three blades and a step-up gearbox which increases the speed from the hub (130 r.p.m. to 750 r.p.m.) to the speed suitable for driving the induction generator which is also contained within the nacelle. The nacelle itself is attached to a pintle shaft to allow the windmill to be yawed round to suit the direction of the wind. This is achieved by a pinion working on a bull-ring gear, the drive being by a small electric motor with a speed-reducing gearbox. The main power and other circuits are taken into the windmill via slip-rings.

The machine is fully automatic, and starts and stops itself untended as and when required by the prevailing wind conditions. This is effected by a small "pilot" windmill (mounted on the top of the nacelle) which turns at a speed proportional to the wind velocity and tells the main control gear when to start or stop the main machine. To prevent a start from a gust in otherwise calm weather, the gear averages the wind speed over a number of minutes.

Starting

When the signal to start has been given by the pilot machine an automatic sequence of operations follows. First, with the clutch between the generator and the rotor disconnected, the generator motors up to speed and starts the oil pumps for main lubrication and the hydraulic circuits. The rotor brake is then released and the hydraulically-operated pitch-change mechanism gradually alters the blade pitch from full "feather" to fine, thus enabling the wind to start up the rotor. The rotor gathers speed at a predetermined rate—irrespective of wind speed—and under control of the governor, and when the speeds of rotor and generator are matched the clutch is engaged. The electrical control gear then measures the electrical output and cuts out resistance in the generator rotor circuit to adjust the governor so that the machine is running at full load. The governor operates by altering the pitch of the blades to suit the varying wind conditions. When, however, the wind rises to about 60 m.p.h. the pilot windmill operates a relay which de-energises the master contactor taking the generator off the line, and the windmill shuts down automatically. The same procedure occurs when the wind falls below the lower setting (about 23 m.p.h.). The clutch in the gearbox remains engaged until the blades have moved gradually to their fully-coarse position so stopping the windmill. When the blades have come to rest, the rotor brake is applied.

Mechanical Features

The windmill has three 17 ft-long blades attached to a three-armed hub so that the swept diameter is 50 ft. The blades are of compressed laminated wood with high tensile steel fittings and are protected against the weather by a special plastic coating. Each blade is attached at its root to the end of the hub arm by hinged joints which allow it to lean forward or "cone" with the wind forces and to lean in the direction of rotation or "drag" due to the turning efforts set up in driving the generator.

The thrust of the wind on the blades is opposed by the centrifugal forces which tend to make them fly out. When the windmill is at rest the blades are prevented from flapping loosely on their hinges by locks which are released as the windmill runs up to speed. In order to prevent excessive vibration when running, the movement of the blades on their hinges is controlled by telescopic hydraulic dampers. The rotor, or assembly of hub and blades, faces downwind in order to reduce to a minimum the distance between the centre of the tower and the blade rotor and, at the same time, to avoid any possibility of the blades hitting the tower as they revolve.

The intense physical difficulties which confronted the John Brown engineers in their task of erecting and commissioning the windmill were recently shown in a short film presented last week, and John Brown's confidence in the future of wind power, particularly for overseas, is shown by their design work for a larger unit of 250 kW.

U.S.–U.K. Nuclear Energy Co-operation

TERMS of the Agreement for co-operation on civil uses of nuclear energy, between U.K. and the U.S.A. are announced in a White Paper published this week. The agreement provides for an exchange of information, materials, and facilities for development, subject to an overriding restriction excluding matters of primarily military significance. The Agreement extends only to what is relevant to current or projected programmes and the development of submarine, ship, aircraft and certain packaged power reactors is excluded.

Exchange of information is to be made particularly in the whole field of reactor design, including reactor engineering and properties of reactor materials. Subjects specifically mentioned in the Agreement include reactor stress and heat transfer analysis, so far as these are pertinent to overall design for best performance, and the effects of operating conditions on the properties of reactor materials. Information to be provided will cover as well as constructional details, the overall design characteristics and operational techniques and performance of various types of reactors. However, exchange of information in this section is to be limited to that in which the Atomic Energy Authority or the U.S. Atomic Energy Commission have played a part. Availability and processing of nuclear fuels is also covered by the Agreement and there is to be full exchange of information on matters relating to health and safety.

Research matters and specialised research facilities are to be mutually available as far as possible, although facilities which are of primarily military significance are expressly excluded. Patents owned by either of the Governments or their Agencies are to be mutually available for use by the other, but there are special arrangements for use of the patents by third parties.

Limited exchange of information on military matters connected with nuclear energy is covered by a further Agreement. The two Agreements are published by H.M.S.O. as command papers 9507 and 9508 respectively.

Sixty CONVENTION Years

1896 – 1955

MEA
IMEA
B.E.P.C

THIS year marks the diamond jubilee of electrical conventions; apart from the interruption during the last war, next week's meeting will be the sixtieth annual event. Appropriately, this year the venue is Brighton, for it was this town that was visited during the first electrical convention in June 1896. Within this span of sixty years electricity has passed from being something of a novelty to the necessity it is regarded today. Here is an achievement of which all can be proud, and now, with the efflux of time, those early days are coming to be accorded a place in tradition; only now is the industry slowly developing a consciousness of its own history.

For the origin of electrical conventions one must turn to July 1895 when, at a meeting of municipal electrical engineers to discuss what were then the new Board of Trade rules, Mr J. H. Rider moved a resolution suggesting the formation of a new association; a committee was appointed to prepare a set of draft rules. The first act of the committee was to secure the services as honorary secretary of Mr W. L. Madgen, general manager of *Lightning*, as the ELECTRICAL TIMES was then called. By the following November, the preparatory work was complete and at an inaugural meeting that month the Municipal Electrical Association came into being, at a time when there were only fifty-one municipally-owned undertakings in the country. The first president was Mr Arthur Wright, one of the pioneers of the industry, intimately associated with the development of two-part tariffs; as vice-presidents the familiar name of Mr C. H. Wording-

ham, of Manchester, appears with that of Mr W. Arnot, of Glasgow.

Among the early tasks of Mr Madgen, whose appointmen as honorary secretary had been confirmed, was to prepare for the first electrical convention in June of the following year, a task for which he co-opted the whole of the staff of this paper. The programme arranged was a strenuous one with a presidential address, nine technical papers, two civic receptions and three technical visits, all within the span of three days. To add to the complexity, a major part of the proceedings were held in London and the remainder in Brighton. Our report of the events was no less exhaustive, extending to fifty pages. Some of the lessons learned from the first convention may be gathered from the programme of the second, which with an easing of the technical load and the inclusion of a fourth day (albeit a Saturday) provided more time for technical visits and the inclusion of the first official dinner.

The programmes of these early days bear a marked resemblance to those of the present conventions. Two points of difference which stand out, however, are the stress then placed on technical visits and the more specific nature of the papers read. None the less, the subjects are enlightening and within the first few years some of the matters discussed are not far removed from those with which we are concerned today. Thus in looking to future load, we find Mr A. B. Mountain suggesting that the ultimate electricity requirements for which the industry must provide, would be some fifteen 8 c.p. lamps per head of the population. The need for assurance of good wiring was stressed in 1900, with the suggested examination of wiremen and withdrawal of the certificate of competence on evidence of bad workmanship. The low load factor of lighting was then causing concern and the view was optimistically expressed that if the power load could be developed "there would not be this peak trouble." Rural electrification was still beyond the horizon but at the first convention thoughts were already extending outwards as shown by the paper on "Extension to Outlying Districts." Then there were such perennial subjects as tariffs, and retailing by electricity authorities; while on sales promotion, some of the points put forward are not wholly irrevelent today. On the other hand, dare we point out that the very live subject of appropriation of profits seems hardly so pressing now.

After the fifth convention, the Association decided to apply for incorporation and from then on became the familiar Incorporated Municipal Electrical Association, which continued to grow in size and status. It is significant that even during the first world war the conventions continued, though shorn of their trappings; only Hitler succeeded in suspending them altogether.

It is impossible to describe the influence this Association has had on the industry. Nor have all their efforts been successful. In 1914 they attempted to promote a Bill to permit municipal trading with discount to be credited to contractors on sales to their clients, very much along the lines that is now being introduced for cookers by some electricity boards. Long drawn-out negotiations with the E.C.A., however, failed to secure agreement.

Between the wars the Association became increasingly active. One such field being cooker standardisation through the E.D.A./I.M.E.A. committee. It was this partnership that led to a small display of cookers and water heaters in 1925 and from this beginning came the exhibitions which are such a feature of present conventions. More recently the Association played the major part in the standardisation of the flat pin plug. No record would thus be complete without a reference to Mr E. E. Hoadley's effort to create a national convention in 1935. Unfortunately this was not repeated and it was only with the winding-up of the I.M.E.A. consequent upon nationalisation that the present broader basis was achieved for the annual electrical convention. But we have overrun the point where history merges into the immediate past and we must end this brief summary with the hope that in the near future someone will chronicle the full history of the industry before those early days pass into obscurity.

SIXTY YEARS—THE CONVENTION RECORD

Municipal Electrical Association

Year	President	Venue
1896	ARTHUR WRIGHT	LONDON & BRIGHTON
1897	C. H. WORDINGHAM	MANCHESTER
1898	A. H. GIBBINGS	LONDON
1899	A. FARADAY-PROCTOR	BRISTOL
1900	A. B. MOUNTAIN	HUDDERSFIELD

Incorporated Municipal Electrical Association

Year	President	Venue
1901	W. A. CHAMEN	GLASGOW
1902	J. H. RIDER	LONDON
1903	J. F. C. SNELL	SUNDERLAND
1904	T. P. WILMSHURST	DERBY
1905	F. A. NEWINGTON	EDINBURGH
1906	J. E. EDGCOME	LONDON
1907	S. E. FEDDEN	SHEFFIELD
1908	H. TALBOT	NOTTINGHAM
1909	S. L. PEARCE	MANCHESTER
1910	W. W. LACKIE	GLASGOW
1911	J. CHRISTIE	BRIGHTON
1912	G. WILKINSON	HARROGATE
1913	C. E. C. SHAWFIELD[1]	LONDON
1914	R. A. CHATTOCK	BIRMINGHAM
1915	H. RICHARDSON	LONDON
1916	A. C. CRAMB	LONDON
1917	F. M. LONG	LONDON
1918	S. J. WATSON	MANCHESTER
1919	F. AYTON	FELIXSTOWE
1920	T. ROLES	BRADFORD & ILKELEY
1921	MAJ. H. RICHARDSON	LONDON[2]
1922	S. T. ALLEN	WOLVERHAMPTON
1923	W. A. VIGNOLES	SCARBOROUGH
1924	S. E. BRITTON	CHESTER
1925	W. C. P. TAPPER	BRIGHTON
1926	R. B. MITCHELL	GLASGOW
1927	R. W. L. PHILLIPS	BUXTON
1928	F. W. PURSE	BATH
1929	A. NICHOLS MOORE	TORQUAY
1930	J. K. BRYDGES	EASTBOURNE
1931	A. J. FULLER	SCARBOROUGH
1932	C. G. MORLEY NEW	CARDIFF
1933	G. PORTER	BOURNEMOUTH
1934	P. J. ROBINSON	LIVERPOOL
1935[3]	E. E. HOADLEY	BOURNEMOUTH
1936	E. SEDDON	EDINBURGH
1937	F. FORREST	BRIGHTON
1938	W. J. BACHE	TORQUAY
1939	H. C. LAMB	HARROGATE
1940	J. MOULD	NO CONVENTION
1941	B. HANDLEY	NO CONVENTION
1942	J. W. J. TOWNLEY	NO CONVENTION
1943	F. NEWEY	NO CONVENTION
1944	F. NEWEY	NO CONVENTION
1945	W. P. LILWALL	NO CONVENTION
1946	ALD. SIR WILLIAM WALKER	BLACKPOOL
1947	J. S. PICKLES	BOURNEMOUTH
1948	J. ECCLES	EASTBOURNE

British Electrical Power Convention

Year	President	Venue
1949	LORD CITRINE	TORQUAY
1950	SIR VINCENT DE FERRANTI	HARROGATE
1951	SIR HENRY SELF	BRIGHTON
1952	P. V. HUNTER	BOURNEMOUTH
1953	SIR JOHN HACKING	TORQUAY
1954	J. R. BEARD	EASTBOURNE
1955	SIR HARRY RAILING	BRIGHTON

[1] Mr J. E. Edgcome appointed president on Mr Shawfield taking up a company appointment. Mr. Shawfield delivered presidential address.
[2] Venue changed from Dundee on account of coal strike.
[3] First National Electrical Convention.

The Programme at Brighton

JUNE 27 - JULY 1 1955

NEITHER the titles nor the contents of the paper to be presented at next week's British Electrical Power Convention at Brighton leave any doubt that the theme is "The Future." The programme on this page shows that the business sessions of the Convention are concerned almost exclusively with this question.

After Tuesday, on which the only full meeting is concerned with the Presidential Address, the eight papers to be presented to the Convention are divided into three groups. In the first of these, Mr J. Eccles, Deputy Chairman (Operations) of the C.E.A., gives a 10-year forecast of developments in generating plant. That occupies Wednesday morning, and the afternoon is given over to papers on three branches of the electrical industry considered as a career—supply, manufacture, and installation contracting. The interest of these papers extends beyond the membership of the Convention.

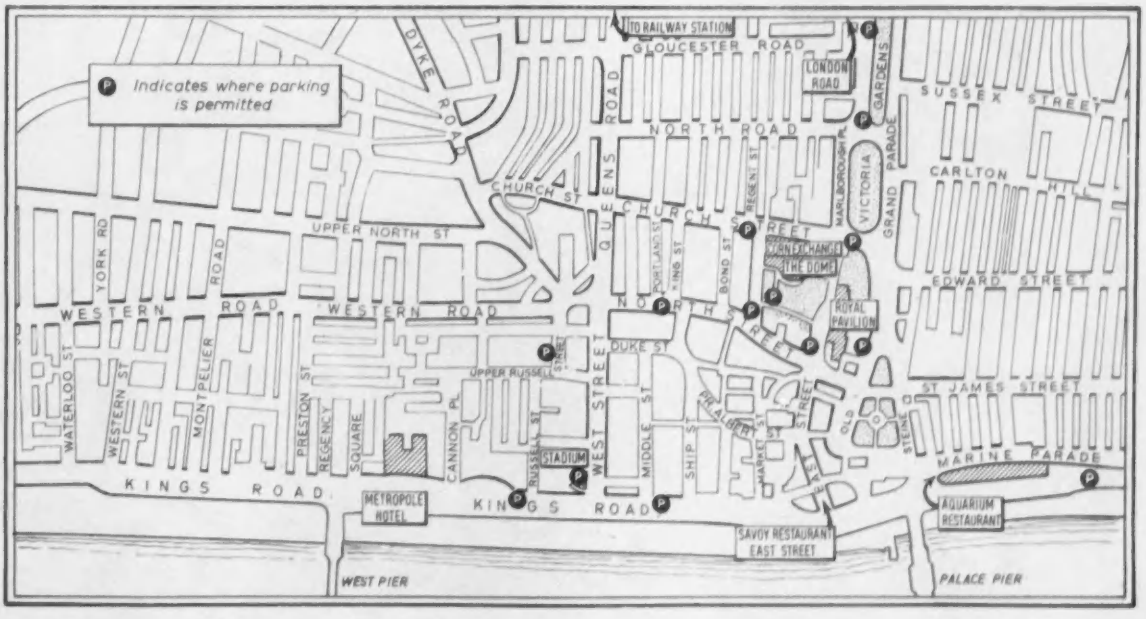
Electrical engineering is not an end in itself, and on Thursday it will be examined in the setting of probable future developments in four other industries. These are steel making, coal mining, chemicals, and catering. In the first three of these an eminent engineer connected with the industry is speaking. The use of electricity in catering is to be dealt with from the equipment manufacturer's angle.

Full use is being made of Brighton's extensive facilities for the Convention. All the business sessions will be held in the Dome, while social functions will take place in the adjoining Corn Exchange. The Exhibition, which is again breaking records for size, is being held in the Sports Stadium, West St, and in addition there is a display of electric catering equipment in a marquee erected in the car park adjoining the Stadium. The exhibition is to be open from 10 a.m. to 6 p.m. on Monday and Tuesday, 10 a.m. to 9 p.m. on Wednesday and Thursday, and 10 a.m. to 4 p.m. on Friday. The general public will be admitted on the last three days.

Golf competitions have been organised on the usual lines. There is a gentlemen's competition in the form of a Stableford Competition for the G. P. Dennis Trophy, and an 18-hole medal round ladies' competition for the Lady Citrine Trophy. Further information on these may be obtained from Mr W. J. Bird or Mr C. F. Boyes at Magnet House, Kingsway, W.C.2, prior to the Convention, or at the Grand Hotel, Brighton, during the Convention.

Monday:	
9.00 p.m.	*Official opening of Exhibition by the President (Sports Stadium, West Street.)*
Tuesday:	
10.00 a.m.	*Civic Welcome and Presidential Address.*
12.30 p.m.	*E.A.W. Luncheon (Metropole Hotel).*
3.00 p.m.	*Ladies' Tea (Aquarium Restaurant).*
8.00 p.m.	*Mayoral Reception and Dance.*
Wednesday:	
10.00 a.m.	*Mr J. Eccles: The Generation of Electricity in Britain—10 year forecast.*
1 p.m.	*Brighton Rotary Club Luncheon (Savoy Restaurant, East Street).*
2.30 p.m.	*Papers by Sir Henry Self, Messrs. S. E. Goodall and R. H. Marryat "The Electrical Industry as a Career."*
Thursday:	
10.00 a.m.	*Papers by Messrs W. F. Cartwright and B. L. Metcalf "Electricity and the Industrial Future."*
2.30 p.m.	*Papers by Messrs G. Nonhebel and F. A. Rogers "Electricity and the Industrial Future."*
7.30 p.m.	*Annual Dinner and Dance.*
Friday:	
10.00 a.m.	*Electrical Forum.*
12.00 noon	*A.G.M.*

Brighton for the Convention Visitor



design for the future

AT THE CONVENTION EXHIBITION

WITH its growth in size and popularity over the last few years, the Exhibition associated with the Convention has become, almost without doubt, the largest display of electrical appliances and equipment outside London. Traditionally, it lays emphasis on domestic appliances, particularly cookers, although recent years have seen a growing display of engineering equipment to attract the supply engineer. This year's show maintains the tradition, and moreover is larger than ever, with well over 100 exhibitors taking part. Compared with last year, the overall picture shows a slight reduction in the number of engineering exhibits, but there is no denying that, as a whole, the Exhibition provides the industry with one of its most valuable shop windows, whilst serving as a useful meeting ground for common interests within it.

Its continued standing as a major exhibition is further exemplified by the number of wholly new equipment and lines which manufacturers are choosing to introduce to the trade for the first time. In most cases, such new lines are numbered among the appliance displays, but a notable switchgear introduction also comes to mind as of engineering interest. Side by side with the new equipment are many well-known lines whose continued display reflects their popularity and proven reliability. No mention of the Exhibition would be complete, moreover, without reference to the non-manufacturing organisations and associations, who are prominently represented.

As has been pointed out elsewhere in this section, the Exhibition is being held in the Sports Stadium, West St, with the engineering exhibits displayed in a marquee in the Stadium's car park. It is here that a notable feature, a display of electric catering equipment is also being shown. During the course of the Exhibition members of the South Eastern Electricity Board's staff are to give demonstrations of the use of electricity in the home. Sir Harry Railing is officially opening the Exhibition on Monday.

English Electric's washing machine Model 4003 has 3 kW immersion heater, power wringer and automatic draining system and is a worthy foundation of future electrical living

Aidas Electric Ltd.

One of electricity's contributions to modern living is water heating, here amply demonstrated by an impressive display of appliances and immersion heaters. Particularly suitable for domestic use is the "Sadia Select" 3 gall. over the sink type water heater. Available in four pastel shade finishes it has a 1 kW rating, taking approximately one hour to raise its three gallons of water to the rated temperature. Of larger appliances they offer their type VDB, 20 gallon heater which now has a modified element system comprising three 1 kW elements with two placed at the bottom and one at the top of the tank. No. 19.

Austin Crompton Parkinson

One of the two firms showing in the vehicle exhibit, this company offer a new "Morrison Electricar" 20 cwt chassis of modern design and robust construction. This chassis, which is available in two forms, having respective body capacities of 175 cu ft and 210 cu ft, has wider and stronger axles and frames, improved springing incorporating "Silentbloc" bushes, and a turning circle of 31 ft, 8 ft less than on earlier models. Accessibility to equipment is generally improved, the batteries being retractable through side body panels. No. 100.

Back view of Dubilier's automatic power factor capacitor for 400 V 50 c/s 3 phase 300 kVAr in five sections of 60 kVAr

Backer Electric Co.

This show of tubular sheathed heating elements again stresses their domestic applications, with a variety of boiling plate types shown. Prominent in the display is their twin circuit "Multicoil" plate, type MC, which has an unusually broad element presenting greater surface area to utensils. Kettle elements and immersion heater ranges are also shown. Examples of their specialised work are seen in displays of element formations designed recently for various appliances, including percolator, iron, washing machine, water bath and chemical bath heating units. No. 21.

Belling and Co.

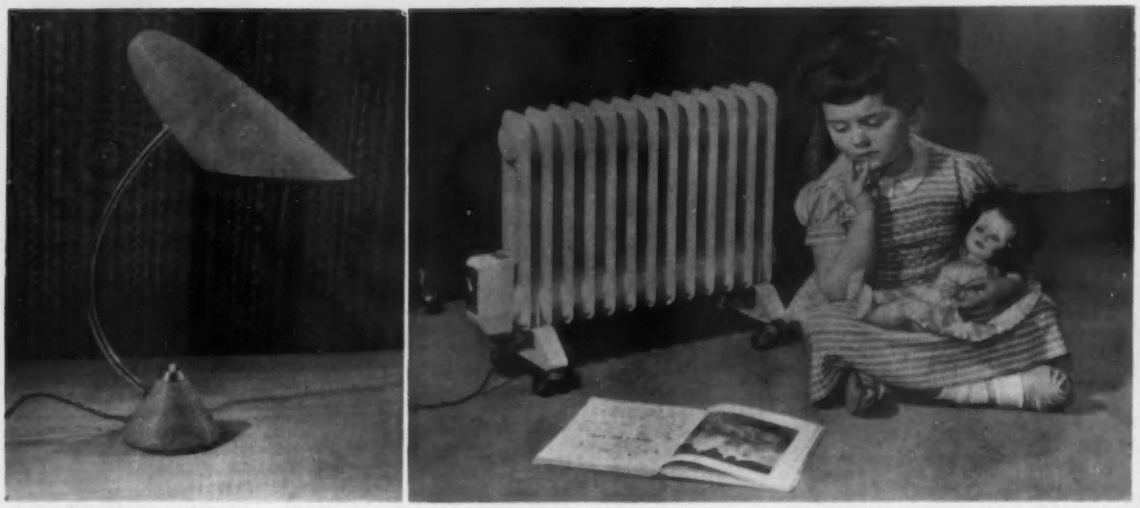
Making its debut in this display of cookers and convector and radiator heating units is the "Overnite" thermal storage heater, of 1½ kW loading. Operating on the now well known principle of thermal storage in which low temperature heating elements buried in storage blocks are energised only at night at special "off-peak" tariffs releasing their heat energy during the day, the heater is particularly suitable for offices, workrooms, lock-up shops and schools. It is not available for sale for domestic use. No. 38.

Berry's Electric

Here the versatility of electricity is particularly well demonstrated, showing how it can readily be adapted to widely different tastes. In six settings—Jacobean, Queen Anne, Adam, Regency, Modern and Contemporary—are framed examples of the fire, wall bracket and ceiling fitting best suited to the particular period. Backing up this attractive show of electrical furnishing is a display of "New Look" water heaters. No. 36.

Best Products

A display of electric kettles, jugs and similar appliances features the modern coffee percolator No. 2, which, entirely automatic in operation, provides the unusual feature of coffee flavour control—either strong, medium or weak. No. 34



With such appliances as Falk's new "Mira" table lamp and this latest Hurseal "Junior" column radiator to provide light and warmth the electrical way this young lady is ensured of a good start in life

Geo. Bray and Co.

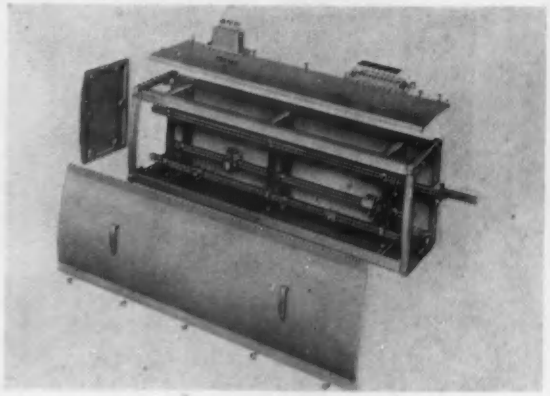
A display of water heating elements of the immersion type forms the bulk of the display, attention being drawn to the heater produced for hard water areas. Its total loading is distributed over two elements to ensure a comparatively low wattage density on the surface. Another heater comprises a single element of high watts density produced to meet the requirements of hire purchase schemes. No. 50.

B.I.C.C.

Reflecting the wide ranging interests of this cable firm in the field of power transmission, the B.I.C.C. stand gives special prominence to the new design of straight joint, as developed by the C.E.A. and C.M.A. specification, for 33 kV, three-core solid cables. The success of British gas-filled cables in overseas markets is shown in a display covering voltages from 33 kV to 132 kV, and of particular interest are aluminium sheathed, 33 kV, impregnated pressure cables and mass-impregnated, non-draining types primarily designed for use in buildings and mines. No. 25.

British National Electrics

In a display of domestic appliances, B.N.E. draw particular attention to their latest cooker with its accent on time and current saving. Their model C.90, its feature is the "Speedheat" oven which attains 400° F in 12 mins. Another field of activity is seen in a representative exhibit of water heaters, including the popular "Twin" model and the 1½ and 3 gallon, non-pressure type appliances rate consideration in view of their recent price reduction. No. 46.



Simplex "Regent" busbar chambers show evidence of modern styling

British Thomson-Houston Co.

"Mazda's" contribution to the exhibition highlights a prototype of a cradle type fitting specially developed for the Velindre mill of the Steel Co. of Wales to simplify maintenance of combined mercury and tungsten lamp fittings. In the form of a steel tray comprising a tee-section frame carrying a floor of rigid wire mesh, the cradle supports reflectors for a 1·5 kW filament lamp and a horizontally mounted 1 kW type MA/H m.v. lamp, the wire mesh also preventing broken glass from falling in case af accident. Cradles are cantilevered out from catwalks, from which the fittings are within easy reach for removal for maintenance, control gear being housed in boxes hung from the handrail. No. 55.

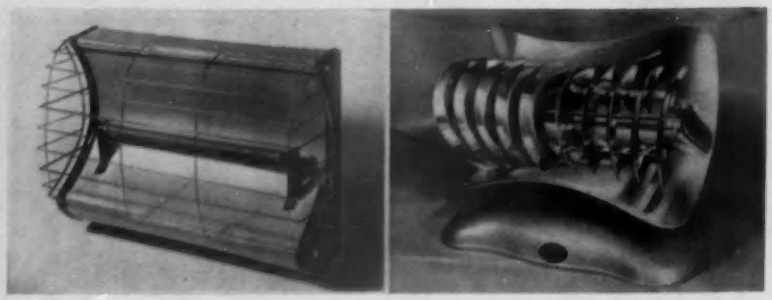
Brit. Vac. Cleaner and Eng. Co.

A newcomer to the B.E.P.C. exhibition in the "Goblin" display is the "Ace" (model G.51) which, with a 500 W motor, places an efficient machine into the hands of the house-proud housewife, who is further assisted by an improved agitator tool for carpets. The "Goblin" washing machine display features the two latest-comers to the range — Models W.130 and W.140. The latter, handling 8 to 10 lb of dry clothes, is a full size all-electric appliance. No. 94.

Brush Electrical Engineering Co.

Appealing to the transmission specialist is the dominant on-load tap changing equipment designed to provide close control of system voltage on power and regulating transformers. Designed for 33 kV operation, the gear utilises the reactor principle for current limitation at the moment of switching and is available in two ratings of 250 and 400 A, giving 21 positions for selection of voltage. Companion exhibit on the stand is an example of their vertical isolation, horizontal draw-out, switchgear type VBA for 6·6 and 11 kV systems. No. 99.

Sixty years has seen a revolution in design of switching equipment. This single unit automatic o.c.b. with certified rating of 250 MVA at 6·6 kV and 350 MVA at 11 kV is by Yorkshire Switchgear and Engineering Co., Ltd.



The new "Thermovent" high temperature panel heater type HTP/07 mounted vertically is seen on the left. The centre illustration shows Ferranti's new "Builders" fire model P.5160, whilst right is H.M.V.'s new "Lincoln" fire in either 2 or 3 kW sizes with switches for half power

Bryce Electric Construction Co.

From a transformer range which extends up to 132 kV units of 15 MVA rating, Bryce have selected a representative variety, including the core and coils of a 500 kVA, 3,300/415 V oil-immersed unit and a 10 kVA distribution transformer complying with the C.E.A. specification T1. From their capacitor production line comes a tank type unit, modified by the fitting of a "Perspex" inspection panel and shown here complete with contactor panel for automatic p.f. correction. No. 90.

Bulpitt and Sons

Particular emphasis in this display of "Swan Brand" electric kettles, toasters and other appliances is given to the increased boiling of their larger kettles, 2,000 W elements replacing the 1·8 W types previously fitted as standard. No. 32.

Cable Covers

Focal point of this impressive show of transmission line accessories is a fully assembled section of o.h. line complete with conductors, connectors, insulators and stay wires demonstrating efficiency of connection obtained by the C.C.L. connector employing their cone-grip principle. Requiring no tools or solder to effect a sound joint, this connecting method is also shown applied to their automatic stay in which tension can be adjusted after installation. Also featured is the "C.C.L.-Arro" line tap, which requires only a spanner to effect efficient connection, whilst a display of the "Talurit" mechanical splice for wire rope systems is also on view. No. 82.

Burco

Of two newcomers to the "Burco" range of domestic laundering appliances, the model 761, 5 gall wash boiler merits special attention. Being only 17½ in. high it can be readily stowed under the sink in the average modern small kitchen whilst its comparatively light weight of 8¼ lb is well within the "man handling" capabilities of most housewives. No. 69.

Chilton Electric Products

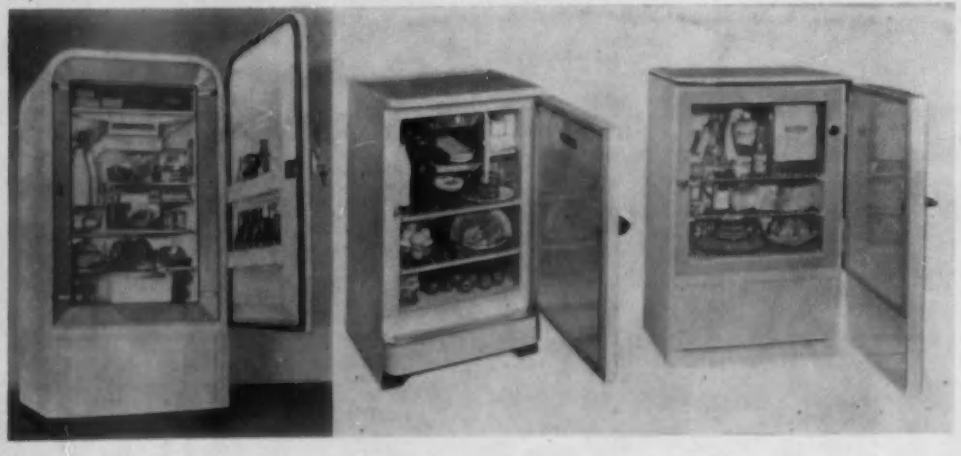
Being demonstrated here for the installation engineer are representative units from Chilton's range of "Atlas" miniature h.r.c. circuit-breakers together with voltage operated earth leakage c.b.'s, shown operating on typical domestic and industrial applications. Another display highlights the comprehensive protection afforded by the combined "Atlas" current balance and voltage operated earth leakage c.b.'s. The other side of Chilton's activities is seen in demonstrations of their "BUK" and "KUB" electric dry shavers and their domestic hair clipper. Of particular interest is a version of the universal shaver socket incorporating, in addition to standard facilities, a 5 A, 3-pin power outlet being fitted in the cabins of the *Empress of Britain*. No. 60.

Carron Co.

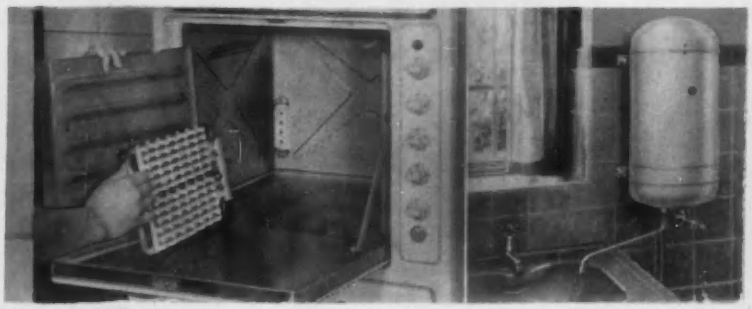
For the modern electric kitchen is Carron's "Cameo" 3-plate cooker, in which the hinged hob is fitted, on one side, with an extension complete with towel rail, and on the other, a kettle holder with a useful control unit regulating the current to the minimum required to maintain boiling. The hob itself accommodates a 6 in. 1 kW, solid hot plate, 8 in. 1·7 kW, radiant boiling plate, and 10½ in. by 8 in. 2 kW grill boiler, the grill chamber below being fitted with side hinged doors and also acting as a hot cupboard. No. 54.

Clang Ltd.

One of two new lines on show in their display of over 300 electrical accessories comprises a range of 13 A surface and flush socket-outlets, available in single and twin versions. They embody a novel shutter arrangement requiring all three pins of the plug to be inserted before the shutter opens, and are offered with either "Bakelite" or porcelain interiors. The associated plug top is novel in making the fuse clearly visible, thus indicating the fusing current at a glance. A companion introduction is a series of weatherproof plugs and sockets, available in ratings from 5 to 50 A. No. 78.



Refrigeration is one of the Industry's four foundations of modern living. Left to right are the Electrolux L500, with 5 cu ft capacity and two table top models the Coldrator CT 33, 3 cu ft type and the GEC DE31M, 3 cu ft unit with "Turn-about" top shelf



Above is the "Speedheat" oven in BNE's cooker. This can be easily cleaned in a matter of moments. Centre is BNE's 1½ gallon non-pressure type water heater and right the new Burco model 761 wash boiler

Coldrator

One of five member companies exhibiting on the British Refrigeration Association, Coldrator display products for both domestic and commercial use. Reflecting the modern use of frozen food is their model VF.54 home freezer, affording a storage capacity of 5·4 cub ft and shelf area of 7·8 sq ft housed in an outer case only 53½ in. high. Temperature is thermostatically controlled to permit a maximum operating level of 0° F. No. 97.

E. K. Cole

Since last year's B.E.P.C., the "Thermovent" range of heating appliances has been extended to include the Type FP, flameproof and Type H, horticultural thermotubes a series of high temperature panel heaters and a watertight thermostat, all of which are prominently displayed. Particularly noteworthy are the high temperature panels, which, available with 625 W or 1,250 W ratings, are intended for use in situations where abnormal heat loss or high interchange of air precludes the use of convector heaters, and are suitable only for local and short-period heating. No. 12.

Crompton Parkinson

Appropriately, the Crompton stand has for its theme the application of their products in distribution and utilisation, set off by an animated mural depicting a main distribution substation, a block of flats, factory and farm with their associated distribution systems. Representing their switchgear products is the latest version of one of the vertically isolated, air insulated, units in the "ALA" range. Complying with the recent C.E.A. specification YP5., the unit is of 400 A rating with a rupturing capacity of 150 MVA at 6·6 kV and 11 kV, and is here seen specially arranged to facilitate inspection. No. 27.

"Diamond H" Switches

Reflecting the "future" theme of this year's Convention, "Diamond H" feature cooker switches and thermostats fitted with the push-on type "fast on" terminals in contrast to the conventional screw and clamp type. Two series of switches are shown thus fitted—a new miniature range suitable for 1·8 kW, 240 V hot plates shortly to be manufactured in this country, and the 3 to 7 AC range. Miniature streamlined push-on handle dials with metal inlays provide an attractive new display. No. 35.

Dimplex Ltd.

In many ways, low surface temperature convection radiant heating is eminently suited for domestic use, and for its enthusiasts is shown here the complete range of "Dimplex" oil-filled thermostatically controlled radiators, which are offered in loadings from 0·5 to 2 kW whilst the eight colour finishes available cater for virtually every decorative scheme. Three types of mounting can be supplied—feet, castor wheels and wall brackets, whilst single and double sided towel rails can be fitted to models up to 1½ kW in size. No. 68.

Dowsing Co.

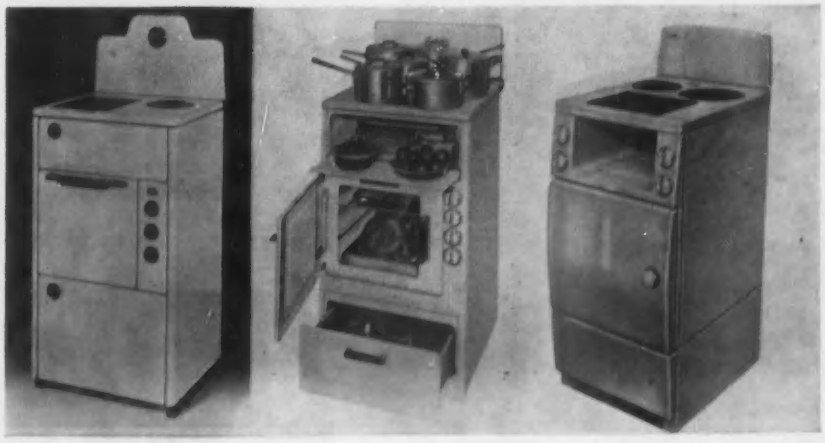
Focal point of this year's Dowsing display is their new electric blanket, details of which are not available as we go to press. Associated with this exhibit are their earlier electric blankets and kettles shown together with industrial electric irons, sealing wax heaters and glue pots. From the associated firm, the Automatic Light Controlling Co., come a display of "Gunfire" time switches. No. 49.

Dubilier Condenser Co.

With the increasing emphasis on reducing kVA demand, the Dubilier stand highlights their power factor correction capacitors shown with automatic control equipment whilst a working model shows the reduction in line current and kVA consequent upon the use of correction capacitors. For fluorescent lighting and other a.c. applications, their "Duconol" capacitors are offered. No. 72.

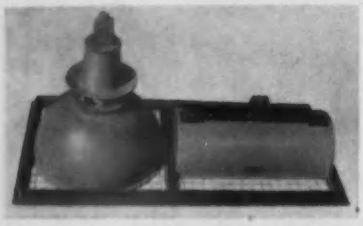
Easiclene

Easiclene's stand is devoted solely to a display of their model EW1 washing machine and 2 cu ft capacity absorption type refrigerator. The former employs a four-vaned oscillating agitator powered

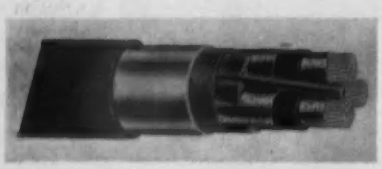


Three examples of contemporary cooker design are these three models. From left to right they are Tricity's new "Coronet" model 500 with auto time switch control. Jackson's model 195 plinth cooker has the "Clearview" inner glass door and can be equipped with the "Cookalone" time control. Simplex offer the model 310 "Star" as an inexpensive cooker for modern homes

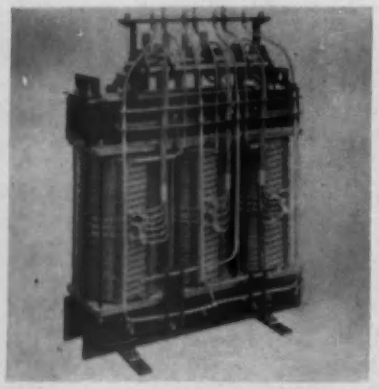
Smith Meters "Sincos" kVA meter brought into production during the past year



"Mazda" blended light cradle fitting for cantilever mounting on cat-walks or high bays developed specially by BTH for the Steel Co. of Wales



Three core 33 kV aluminium sheathed impregnated pressure cable of the type exhibited by B.I.C.C. at the B.E.P.C.



View of h.v. side of 500 kVA 3,300/415 V 3-ph 50 c/s. oil immersed transformer removed from its tank and shown by Bryce Electric Construction Co.

by a 250 W motor, a manually operated wringer, and has a dry clothes capacity of 4½ to 5½ lb. No. 66.

Edison-Swan Electric Co.

Featured on the "Ediswan" stand is the shallow trunking system suitable for mounting all types of lighting fittings, and, by virtue of its small depth, not out of place in offices and stores. Since the whole of the interior is available for cable, the trunking can accommodate not only wiring for the lighting circuits but also for circuits supplying small power equipment which may either be mounted on the trunking or fed from socket-outlets placed at any desired position on it. No. 26.

Ekco-Ensign Electric

Representative fittings illustrate the wide variety of units offered by Ekco-Ensign, a prominent feature being their recently introduced 5 ft, 80 W "Slim Batten" fitting. Industrial and decorative units are also displayed. Of Ekco lamps, emphasis is laid on their "white" fluorescent lamps shown together with other shades and colours offered to industry and commerce, with accessories and control gear. No. 65.

Electrolux Ltd.

The Electrolux "eye-catcher" in this display of domestic appliances is undoubtedly the Model 55 suction cleaner, which with its useful attachments and powerful motor, is an ideal all-purpose cleaner for the modern home. A particularly useful attachment now available is the turbo-polisher powered by indrawn air flow and which is provided with polishers for both floors and furniture and cars. No. 95.

Geo. Ellison

For the switchgear specialist there is an impressive display of units for industrial and power station auxiliaries including a group of the recently introduced direct-to-time 20 A starters mounted on a bus-bar chamber for sequence starting. The switchboard shown is a further development of the systems, which incorporates built-in insulators, h.r.c. back up fuses, safety interlocking arrangements, long-life contacts and quickly resetting protective devices. No. 92.

English Electric Co.

In a display wholly devoted to domestic electrical equipment, English Electric offer a wealth of appliances for the modern electric home. Foremost in the housewife's regard is the cooker, here represented by the automatic model 2011 which employs a plug-in control panel containing oven timer switch, ringer timer, neon pilot lamp and independently switched 13 A socket-outlet. Equipment for the home laundry is seen in the two washing machines, each fitted with power wringer and automatic drainer and one, the 4003, complete with 3 kW immersion heater. No. 48.

Falco Electrical Appliances

Pride of place in the Falco cooker exhibit goes to the "Royal," a modern cooker of pleasant design incorporating a control unit for automatic cooking. The hob is particularly useful, providing three radiant type hot plates—two of 8 in. dia., each 1·7 kW and one 6½ in. dia., 900 W. A separate grill has a 3 kW loading, all elements being fitted with "Simmerstat" control. A particularly large oven is provided, its heating elements rated at 3·5 kW total. No. 56.

Falk, Stadelmann and Co.

Prominent among exhibits displayed by Falks are two illuminated electric fires of distinctive and novel design. Bearing the names of "Felicity" and "Serenity," the fires are particularly appealing for an attractive lighting effect giving a cheerful glow, quite separate from the heating elements, which provides sufficient light for comfortable television watching. Specially designed to fit into the average fire grate, both fires have a 2 kW loading, "Felicity" fitted with a single 60 W amber-coloured lamp and "Serenity" with two lamps, one amber and the other green. No. 2.

Ferranti Ltd.

Several new electric fires merit special attention on this stand, a notable model being a wall fire for use in bathrooms, nurseries, sanatoria and the like. Two versions are available, 750/1,000 W and 1,000/1,250 W, a common feature being the provision of an adjusting rod to control the direction of radiation. Another fire, model P.5160 is specially designed for use where furniture may have to be nearer the heat source than is normally required, whilst a thermostatically controlled 1 kW convector heater is also shown. No. 13.

Frigidaire

From the Frigidaire range of eight domestic refrigerators, four representative units are shown on the B.R.A. stand displaying several of the colours in which each model is available. For the average sized kitchen is the 4·3 cu ft model, supplied with or without table top, and fitted with a 12 position cold control, hermetically sealed "Metermister" power unit and, in the "De-Luxe" version, interior lighting and "Quickube" ice tray. No. 97.

General Electric Co.

The G.E.C. feature this year is automatic cooking, their DC114 cookers in white and two-tone ivory shown fitted with the DC140 auto-timer, which comprises an oven timer capable of switching the oven on and off for a meal required up to 12 hours ahead and a clockwork ringer timer. A recessed lamp provides illumination for both hob and timer. Among refrigerators on show is their recent introduction, the DE31M, an improved version of the original DE31 and fitted with a "Turn around" top shelf which leaves space for storing tall bottles in one position and provides extra shelf area in the other. No. 41.

Gillott Electro-Appliances

Displaying the efficiency and convenience of electric heating is a useful variety of space and water heating appliances ranging from "Duo-Coil" immersion heaters to unit fan heaters. Particularly suitable for the nursery or for airing clothes, where high surface temperatures are to be avoided, is the "Glo-Warm" convector heater, a 1 kW unit fitted with a "Glo-lite" indicator lamp showing when it is in operation. No. 31.

Griffiths Bros. and Co.

Manufacturers of "Ferrodor" metal protection coatings, protective paints, and insulating varnishes, Griffiths display, pictorially and otherwise, electrical applications of these materials and welcome all visitors wishing to inspect the coatings. Many applications for "Ferrodor" occur within the supply industry, utilising the rust inhibiting properties of primers and the protective durable properties of its micaceous iron ore weathering and finishing coats. No. 70.

Hague and Mackenzie

Displayed here is the normal range of "Pyramid" ground base utensils for use on electric hotplates, together with the more recent black ground base types for use on cookers carrying both radiant and solid hotplates. An additional feature this year is a show of large capacity utensils for commercial catering. No. 29.

Hall and Pickles

For the heating specialist is displayed "Nicralloy" and "Kanthal" alloys, tapes and wires, capable of operating at temperatures up to 1350° C, shown together with "Kanthal" pyrometer sheaths, "Nikrothal" industrial tubes and radiant tube plates, and furnace elements. Against a symbolic house and factory background, the display demonstrates the all round application of these metals for heating elements for domestic and industrial appliances and components. No. 22.

Harborough Construction Co.

Exhibiting in the electric vehicle display, this firm is showing selected items from their range of "Harbilt" battery-electric trucks. Among products from their commercial range, Harborough offer a pedestrian controlled milk truck and for industrial use are made low loading types, fork lift trucks capable of lifting 1,200 lb to 9 ft and a tug rated to tow up to 4,500 lb. No. 100

Heatrae Ltd.

Being introduced to the trade at the Exhibition is a new range of water heaters known as the "Lido." Available in 1½ and 3 gall capacities, they can be supplied in one of a number of attractive colours. Apart from a statement that the heaters combine maximum efficiency in minimum space, no further information is available as we go to press. Other heaters for domestic use on show include the "Saferod" high level wall mounted safety space heater. No. 10.

W. T. Henley's Telegraph Works Co.

An entirely new note is struck by this year's Henley stand, which takes the form of a light and airy lounge to provide a haven of rest for those suffering from "exhibition feet" and would rather sit and chat about their problems. Decorating the walls of the lounge, however, are views of some of the more outstanding cables recently produced, ranging from 3-core, 132 kV oil-filled cable supplied against the contract for the C.E.A.'s Agecroft generating station and an interesting corrosion resisting, p.r.c. sheathed cable applied for the Shell Refining Marketing Co. No. 37.

H.M.V. Household Appliances

Taking pride of place on the H.M.V. stand are two reflector radiant fires of novel design claimed to overcome disadvantages of conventional models. Known as the "Lincoln" and "Ely," they employ an unusual, duplex-curved, multi-parabolic reflector, spreading the heat in an arc of some 150 degrees in front of the fire, the design of reflector aimed at ensuring uniform distribution. The "Lincoln" employs rod elements rated at either 2 or 3 kW (with switch to provide half power running) whilst the "Ely," designed for the smaller room, is equipped with a single 1 kW element. No. 11.

Hoover Ltd.

All Hoover's products can be seen displayed, ranging from the heavy duty vacuum cleaner to fractional horse power motors. Of their cleaner exhibits, the latest cylinder type, model 417 provides the housewife with a powerful, all-purpose cleaner equipped with a useful variety of cleaning tools. For the home laundry, three models of the Hoover washing machine are shown, together with the steam or dry iron. No. 53.

Horstmann Gear Co.

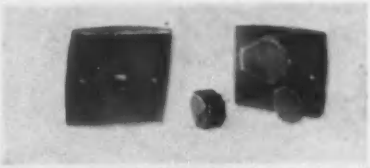
With all restraint on demand removed, the need for limitation at peak-load periods arises to improve load factor. For such ends, this firm show a variety of time switches suitable for controlling water heater and similar loads, particularly the type "Y" unit, a compact assembly having an electrically wound spring mechanism with a 12 hour reserve. Being of the plug-in type, moreover, it is readily removed from the circuit without disturbing wiring. No. 17.

Hotpoint Electric Appliance Co.

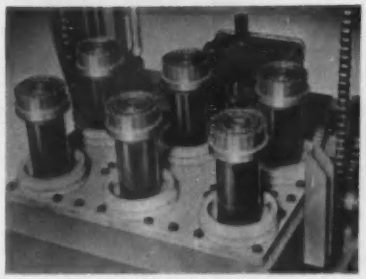
Emphasis on Hotpoint's stand is placed on their provision for the home laundry, a prominent feature being their model CG/P washing machine. Modern in design, it provides a power driven safety wringer incorporating automatic pressure adjustment, and a pump for bowl emptying whilst its motor is fitted with o.l. protection. No. 18.

Hurseal Ltd.

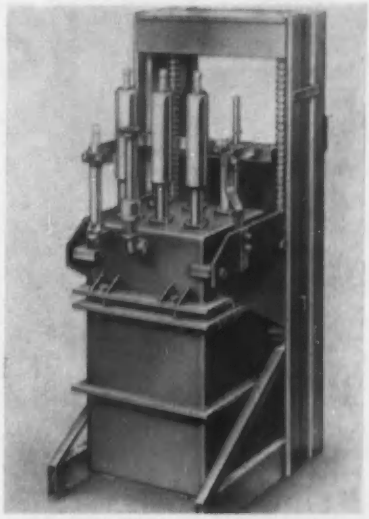
Two particular models merit attention in this display of electric oil-filled radiators, one being a recent addition to their



The new model plaster depth switch and fireside triple socket by New Day

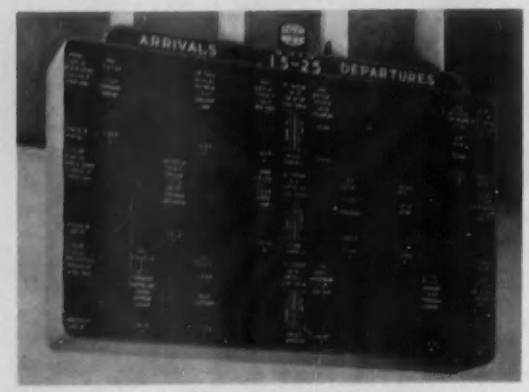


"Tufnol" insulators assembled in an Ellison 11 kV circuit-breaker

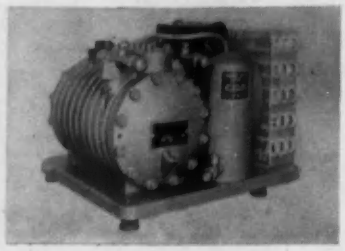


Brush type Q oil circuit-breaker mounted on truck for VBH switchgear unit

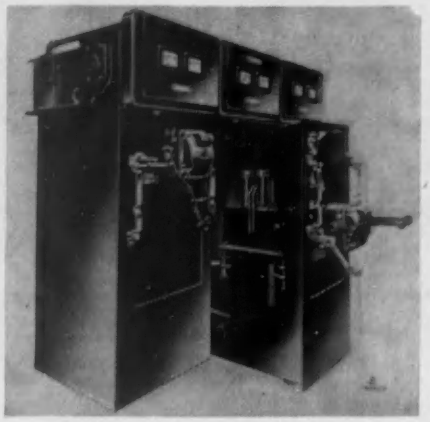
A "T" type switchfuse board by South Wales Switchgear for service up to 660 V and 800 A



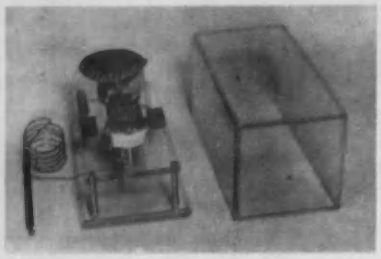
Siemens have built this complete indicator board of the new high speed system for an airways terminal



Marco "Serviseal" condensing unit type F2-50 powered with ½ hp motor



George Ellison's 11kV 250 mVA switchboard with one c.b. lowered to isolate it from the bars and truck withdrawn for inspection



Maclaren and Co's new "Thermo-time" regulator Type TR/L

range of portable panel models in the "T.V." series. Having a heating surface of 10·21 sq ft, its loading of 750 W provides background warmth for the smaller room. Another 750 W heater is the "Hurseal Junior" column radiator, which, being portable, is eminently suitable for nursery or bedroom use. No. 15.

Jackson Electric Stove Co.

The increasing popularity of automatic cooking focuses attention on the "Cookalone" auto-timer, featured in an animated display illustrating its operation and application. The unit is available complete with tubular supports for both the 190 and "Two-Ninety" series of Jackson cookers and also as a wall mounting unit for use with all thermostatically controlled cookers. In the display of cookers, pride of place goes to the "Two-Nine-Five" with its two 8 in. boiling plates and roomy oven. No. 61.

Johnson and Philips

Since the specifications for oil-immersed switches for operation at up to 33 kV in a forthcoming British Standard are likely to require the onerous duty of making on to a short-circuit, the old design of such switches will, in many cases, have to be replaced by new ones. Resulting from a study of the draft form of the specification, CR(ELE) 2032, J. and P. now introduce a new design of oil switch, type YP, complying with the requirements therein, and designed for service at up to 11 kV with a rated normal current of 400 A, and for system fault capacities of 75 MVA at 3·3 kV, 150 MVA at 6·6 kV and 250 MVA at 11 kV. Tests to which the switch has been subjected embrace breaking 30% and 120% of rated current and making capacity tests at 33·4 kA peak at 11 kV on main busbars and internal earthing contacts. No. 47.

Kelvinator

Five models have been selected for the Kelvinator display in the B.R.A. exhibit, outstanding being the "De Luxe" version of their series of 7 cu ft refrigerators. The other two versions of the 7 cu ft models are also shown, together with standard models of their 4 cu ft and 3 cu ft units. No. 97.

Langley London Ltd.

The visitor to this stand will appreciate the high standard of electrical insulating material manufactured by the company, whose quality is further assured with the completion of a new test shop in their factory at Crawley. Not only are they able to claim a guaranteed compliance with British Standard and other specifications, but, to maintain a high standard of general quality, their entire production is batch tested at various stages in its manufacture. No. 16.

Line Equipment Ltd.

Products from L.E.L.'s range of switch and fuse gear for o.h. line distribution systems provide a display of considerable engineering interest. Among the items on show are seen expulsion fuse switches of both standard and repeater types, 11 kV standard rocking switches and fault throwing and load break switches, the latter incorporating interrupter heads, for 33 kV operation. To complete the display are liquid and expulsion type fuses shown with transformer excess load indicators. No. 74.

Robt. Maclaren and Co.

Of special importance in this display of thermostats and temperature regulating equipment is Maclaren's "Thermo-time Regulator," which, on show for the first time, combines thermostat time clock and programme cam. One of its more important applications in the supply industry is the precise control of "off-peak" space heating systems which rely on the thermal storage capacity of the building for maintaining temperature during the daytime. The type TR/L—C is most suitable for this purpose, having 14 ft of capillary as the temperature sensitive device which can be positioned to respond to both indoor and outdoor temperatures. No. 43.

Marco Refrigerators

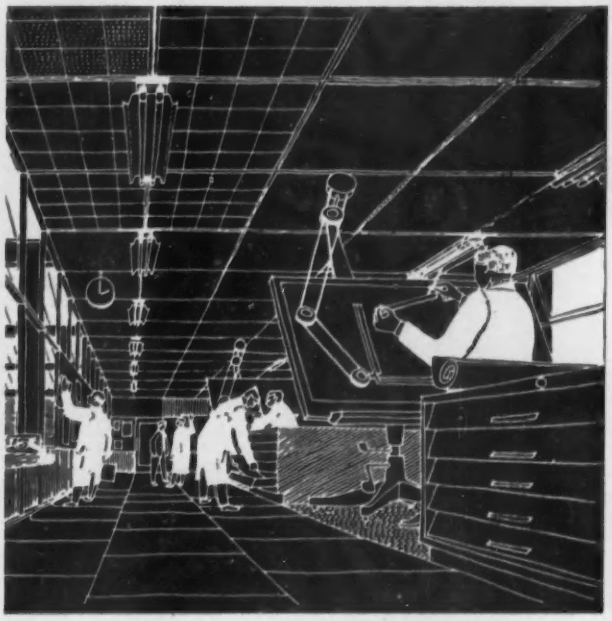
For the hotel and catering and food industries Marco provide a display of commercial refrigerating equipment ranging from a handsome 13 cu ft cabinet to an under counter bottle cooler. In view of the increasing popularity of self-service, their "Majestic" display cabinet merits particular attention. Available in 6 ft and 8 ft lengths it provides storage at both low temperature—for frozen foods—and at medium temperature for normal purposes. The former is located in the lower compartment and the latter in the first of two shelves, both sections being lighted by fluorescent lamps to enhance the display. No. 87.

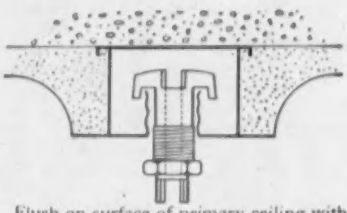
Martindale Electric Co.

In a variety of industrial maintenance current-consuming appliances, particularly notable is their latest industrial vacuum cleaner, model 120. Of pleasing

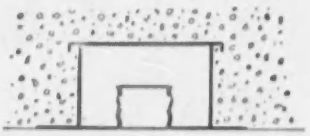
The New 'Invertrunking' by Mazda

Supports conventional ceiling boards in suspended ceiling.

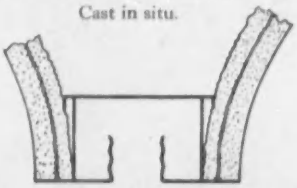




Flush on surface of primary ceiling with shallow plaster cove.



Cast in situ.



In conjunction with expanded metal for deep coves.

This new extruded aluminium cable-conduit has been designed to carry lighting fittings, electrical fixtures and cables. It supports ceiling boards, and can be built into structural ceilings.

Wiring can be laid in the Invertrunking after the ceiling is in position — even after it is decorated — and easily altered from time to time.

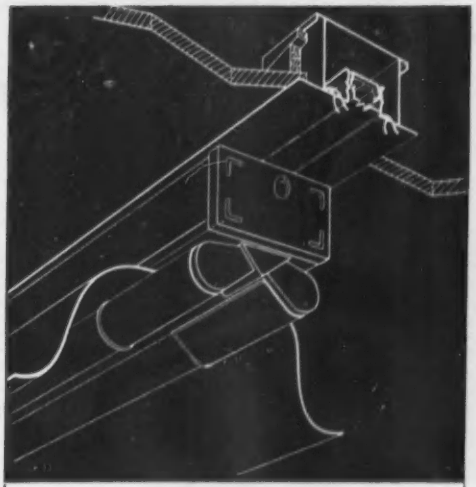
Invertrunking is jointed by aluminium channel sections, and there are Angle, Tee and Crossover pieces.

Literature on application

Wiring features

- ★ **New 'Parablock' connector permits rearrangement of lighting layout and changes of fitting, without altering main circuit wiring.**
- ★ **Special ¾" conduit Tee bolts support lights and other fittings, directly or on chain or conduit.**
- ★ **Takes any Mazda fluorescent or tungsten lighting fitting and other electrical equipment, such as clocks, loudspeakers, etc., provided with ¾" conduit fixing.**

'Invertrunking' is a Registered Trade Mark (Patent App. No. 34581/53)



Mazda F1160
Fluorescent Fitting with Invertrunking.

Mazda welcome you to Stand No. 55

at the B.E.P.C. Brighton 27th June — 1st July

B T-H

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A personal invitation to you

When you visit the B.E.P.C. at the Sports Stadium, Brighton, (27th June–1st July), you'll find it well worth while to look in at the Siemens Brothers Group of Companies Stands 8 and 9. Here we are exhibiting a wide range of our products. There will be skilled technical sales staff available to answer any questions and give advice on particular problems. Afterwards we are at home to you at Robertson Hall, Ship Street.*

We are running a special car service between the Exhibition and Robertson Hall.

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ALFRED GRAHAM & CO. LIMITED

appearance despite its robust construction, the cleaner is fitted with two motors, of total rating 1·5 kW, which may be run singly or together, the maximum suction obtained being 60 in. water gauge. No. 89.

Metropolitan-Vickers Electrical Co.

Prominence in the "Metrovick" display is given to a new design of "Redring" boiler-griller, designed to give high performance for boiling as well as grilling. Its primary feature is the "two-level" element, which presents a suitably raised circular area of heat for boiling and, by virtue of the raised centre portion, avoids excessive concentration of heat in the centre when grilling. Other exhibits of "Redring" heating elements feature the finned oven heating elements designed to give uniform heat distribution and quick response to alteration in temperature setting. Of their engineering exhibits, a noteworthy display comprises a model of a 100 MW, hydrogen cooled generator, specially constructed to reveal internal ventilation ducts and direction of flow of gas. No. 45.

Metway Electrical Industries

A recently introduced automatic version of the "Miniway" 2-pint, 750 W kettle, known as the "Miniway De Luxe" is an exhibit on this stand. This model retails at 42s. 9d., and apart from its incorporation plug-ejector type element, is the same as the 34s. 9d. non-automatic model—4-pint and 6-pint kettles are also shown, together with a wide range of replacement elements and wiring accessories. Away from the kitchen, there is a completely new range of chicken brooder units. No. 73.

Midland Silicones

Properties of silicones and the ways in which they are used to form a full range of Class H insulating materials are featured here. Included in the exhibits is woven glasscloth coated with silicone varnish, which is recommended for continuous operation up to 200° C and intermittent operation up to 300° C. Silicone rubber—"Silastomer" is presented in many forms. No. 44.

M.K. Electric

An advance towards a standard switch is the M.K. "Gridswitch" shown on this stand. With this design, only three boxes and four basic switch and grid assemblies are used to build a range of various types up to eight-gang, suitable for both flush and surface work and with either metal or insulated front plates. All components are completely interchangeable. Switches are mounted on removable grids for easy wiring. The company also has on display a feature devoted to encouraging the provision of an adequate number of socket-outlets in domestic installations. No. 67.

Monsanto Chemicals

Capacitor impregnants and transformer cooling fluids in the "Aroclor" and "Pyroclor" range are again displayed by this company, together with "Lustrex" polystyrene. The "Aroclors" are claimed to permit reduction in capacitor size by as much as 40%, and have the advantage of being fire-resistant. In the "Pyroclor" display, a transformer working at higher than normal temperature is shown. Applications of "Lustrex" put on view include mouldings of radio cabinets and large refrigerator components. No. 79.

Morphy-Richards

Exhibiting at the Convention Exhibition for the first time, Morphy-Richards are showing their full range of household electrical appliances. These, of course, include the recently introduced spin dryer, as well as longer-established items such as irons, fires and heaters, toasters, the hair-dryer and door chimes. No. 6.

New Day Electrical Accessories

Prominent in this display of wiring accessories is the recently introduced range of tumbler switches, socket-outlets and plugs of modern design in keeping with present day styles of interior decoration. Flush fitting accessories depart from the perfect square shape by the use of slight barrelling, whilst bevelled edges are also introduced. Plugs are shaped in a symmetrical eight-sided figure based on the oval and are designed with adequate finger grips. No. 30.

Parnall (Yate)

Washing machines shown on this stand include the Thor "Automagic" clothes and crockery washer which incorporates spin drying. Home laundry is carried a stage further in the company's "Ezy-Press" flat-bed ironer. This versatile adjunct to a washing machine incorporates thermostatic control. It retails at £28. 17s. 6d., tax paid. No. 58.

Partridge, Wilson and Co.

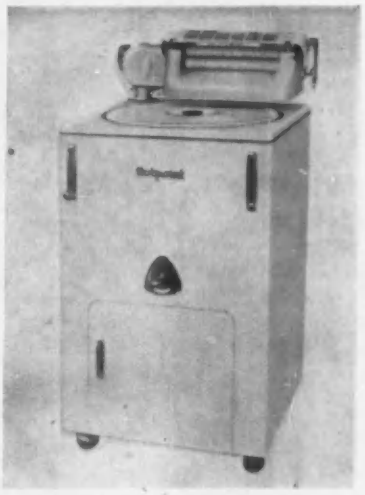
Distribution gear in the "Davenset" range is featured by this firm. Battery chargers and similar equipment are shown as applied to switch tripping and closing, and beyond such direct supply adjusting applications, there are examples from engine starters and from the cathodic production of buried pipelines and structures. No 85.

Pirelli-General

Super tension cables have been selected from the company's wide range of manufacture for attention at this exhibition. Principal exhibit is a section of a 3-core 132 kV oil-filled cable stop joint backed up with sample cables and photographs of installations. No. 80.

Premier Electric Heaters

The company's "Fine-Quality" range of appliances is shown on this stand, including the "Pylon" kettle which is available in chromium plate, polished copper or aluminium finishes. Recently introduced fires are presented, amongst which the "Guardian" model is particularly notable. This is a 2 kW fire model, fitted with a chromium plated reflector, and available in three different colours. No. 64.



Hotpoints CH/P washing machine is a heated version of a well proven appliance

This Martindale industrial vacuum cleaner holds up to 4·25 cu ft of dust

The Falco "Royal" cooker with thermostatically controlled oven operated by automatic timer or manual switch is in the forefront of modern cooker design

Pressed Steel Co.

Four refrigerators made by this company are shown on the stand of the British Refrigeration Association. Two are versions of the capacity models, which are exhibited to stress the availability of left-hand and right-hand opening doors. A 5 cu ft model is shown in a cream finish. Finally, the 7 cu ft model includes such luxury features as two new-design bottle and egg shelves inside the door, and an extra-large frozen-food locker, capable of storing 22 lb of packaged frozen foods. No. 97.

Revo Ltd.

A newly introduced cooker, the Revo "Regent" is the outstanding exhibit here. It is a grey finished unit with white door and splashback, supplied in two models, one (553) having grill boiler and two boiling plates and the other (552) with grill boiler and one hot plate. Both models are available with either legs or plinth base. The 8 in. hot plate is controlled by a "Simmerstat" and three-heat switches are available for the 6½ in. boiling plate and grill boiler. The cooker is featured as being suitable for the smaller type kitchen. No. 57.

A. Reyrolle and Co.

The company's activities in the field of nuclear energy are featured on this stand in the form of a site model of the experimental nuclear power station now being built at Calder Hall. In addition, the company's more traditional products on view include some new relays, amongst which an alarm relay with a number of novel features is particularly noteworthy. No. 84.

Rheostatic Co.

Introduced to answer industry's demand for a cheaper thermostat, the "Satchwell" VC thermostat is the outstanding exhibit on this stand. This model is only 5 oz in weight and is correspondingly compact. It contains the essential features of the company's previous developments, including magnetically controlled micro-gap switch, stabilised brass and nickel-iron alloy temperature sensitive member and stable insulation together with easily accessible terminals. Its temperature adjustment has been simplified to permit normal operation by an electrician only. The thermostat is fully interchangeable with other built to B.S. 1555:1949. No. 71.

Salford Electrical Instruments

Remote indication of linear displacement is important in many industries, and suitable equipment for this purpose provides the main feature on this stand, noteworthy being an electro magnetic transducer. This is being used for remote indication of such measurements as the axial differential expansion of turbine shafts with respect to cylinder casings. The system comprises an electromagnetic measuring head and a recorder/controller or a special moving coil instrument of the dynamometer type. Mechanical displacement of less than 0·001 in. can be measured directly with this system, and the transducer itself is readily converted into a pressure-measuring device. No. 20.

Sangamo Weston

Examples of single-phase and polyphase Sangamo meters are on show, together with rotating substandards and other metering accessories. Examples from the range of Sangamo time switches are also displayed. In a representative selection of Weston electrical instruments are seen switchboard and panel instruments, in round, rectangular and edgewise patterns as well as laboratory standard and sub-standard instruments. Portable instruments and test sets and examples of the newly developed range of hermetically sealed instruments can also be seen. No. 33.

Santon Ltd.

Designed to facilitate the more economical use of immersion heaters, the "Econometer" is a time controlled unit which will switch off the immersion heater or other heating appliance at any time up to two hours after it has been set. Provision is made for the unit to be locked in the permanently-on position when required. Another new introduction shown on this stand is the "Beaver" range of immersion heaters, which are constructed to accept either an orthodox rod type thermostat or the company's "Otter" fixed setting instrument. Finally, amongst the large range of exhibits may be noted the newly designed "Monmouth" dual purpose thermal storage water heater. No. 59.

Siemens Bros.

In keeping with the Convention theme "The Future," this stand will be dominated by the recently developed Siemens high speed indicator which is intended for use at railway termini, airports and other travel centres, for displaying arrival and departure notices and for all applications where information is required to be displayed. A binary controlled circuit breaks the latest type of switching apparatus to give rapid changes of the slats carrying information to be displayed. A feature of the indicator is the use of fluorescent paint in conjunction with illumination by the company's ultra violet lighting. It is possible to control the indicator from a typewriter keyboard. The company is following last year's experiment of arranging a "Reception Centre," which this year is at the Robertsons Hall, Ship St. No. 8 and 9

Simplex Electric

A notable new introduction on this stand is the Creda "Crusader" three gallon water heater, available at competitive prices. The well-known "Super Comet" cooker is once more displayed to show what can be done in the way of automatic time control cooking, and the "Creda Star" cookers are also presented. Selections from the new "Double 'D' Redhead" Immersion Heaters are on view, these models having a thermostat pocket made double the diameter. No. 39.

The "Econometer" time control is a new unit by Santon Ltd

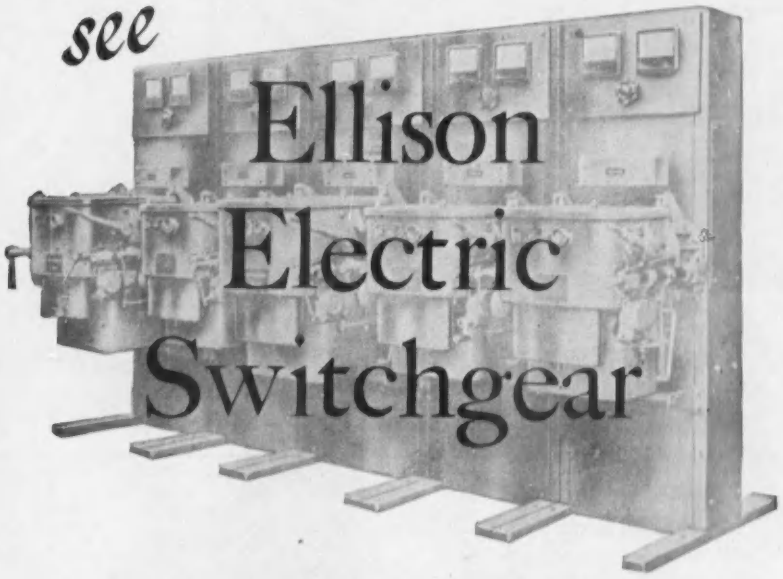
Ekco-Ensign include their new 5 ft 80 W "Slim Batten" fitting in their display.

On the left is Parnall (Yate) Ltd's EW 50 washing machine which in heated and non-heated versions is still a best seller

Unusually styled 3 gallon storage water heater is this new "Crusader" by Simplex.

British Electrical Power Convention Exhibition

see



Ellison Electric Switchgear

STAND 92

SPORTS STADIUM, BRIGHTON

JUNE 27th—JULY 1st

GEORGE ELLISON LIMITED · PERRY BARR · BIRMINGHAM · 22B

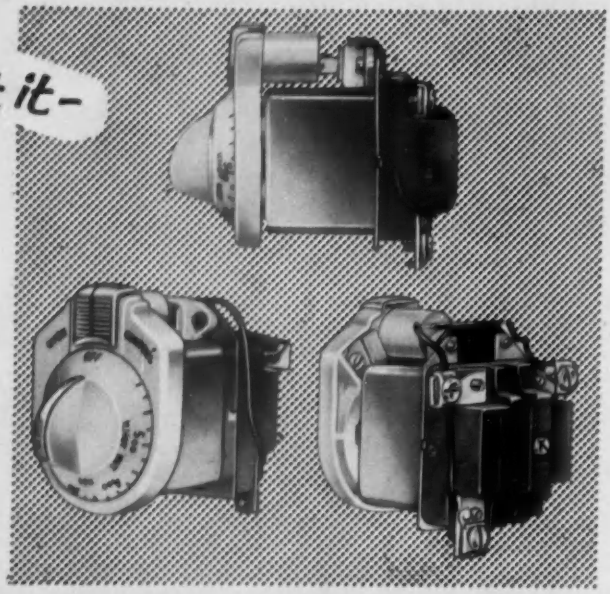
740

See the 'DIAMOND H' range of streamlined THERMOSTATS at the B.E.P.C.

Whichever way you look at it—

NO OTHER OVEN THERMOSTAT HAS ALL THESE FEATURES—

- ★ Front of panel calibration.
- ★ Positive mechanical indexing in the "OFF" position.
- ★ Hydraulic type—thus the sensitive phial can be placed in the most efficient position in the oven and the instrument head in the most convenient place.
- ★ Easily replaceable plug-in-neon pilot light. Average life 7 years.
- ★ New high lever ratio switch movement.
- ★ Also fitted with Grill switch for 3 stage Preheat control series 9TH-13TH.
- ★ Streamlined push-on handle dials with metal inlays available in wide range of colours.



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stand no. 12

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Smith Meters

A complete meter test set together with a meter test rack are featured on this stand. In addition are shown the company's complete range of house service meters and also their "Sincos" kVA meter which has been brought into production during the past year. No. 51.

Smith's English Clocks

Electric clocks made by this company are naturally featured on this stand, but also in evidence are the electrically controlled units for timing control of cookers, refrigerators, etc., which are made in the factory of Smith's subsidiary company, Pullers Instruments Ltd., situated just outside Brighton. Amongst the clocks a feature is made of alarm designs. No. 98.

South Wales Switchgear

Recent developments in switchgear design are incorporated in an 11 kV, 250 MVA, 400 A circuit-breaker shown on this stand. Incorporating a die-cast top plate, porcelain through bushings and arc control pots, this model (Type C4X) is intended to meet the requirements of many large consumers for an arc-controlled breaker in the lower breaking capacity range. Another model, the type UE.1, 33 kV, 1,000 MVA, metalclad air-insulated unit with vertically isolated oil circuit-breaker is represented by a scale model. No. 75.

Standard Telephones and Cables

Cable exhibits on this stand include a 132 kV oil-filled cable designed to operate at a 100 kV/cm electric stress. Particularly of interest in the design is the employment of semi-conductive carbon black paper tapes as a conductor screen, with metallised carbon black paper as a core screen. In the field of power factor correction, there is an advanced design developed for use in 27·6 kV, 10 MVA banks which are to be installed by the Hydro-Electric Power Commission of Ontario. A 33 kV transportable cable test set is featured as an example of rectifier application. No. 40.

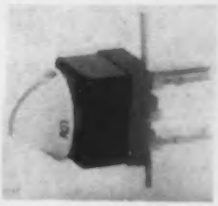
Sunbeam Electric

Two well-known products of the company are shown on this stand. One is the "Mixmaster" with which are shown such additional attachments as a blender, mincer, slicer and shredder, and juice extractor. The other is the "Shavemaster" dry shaver which is offered with a 5 year free service guarantee. Both a standard voltage model and one ranged for multi-voltage use are available. No. 7.

Sunvic Controls

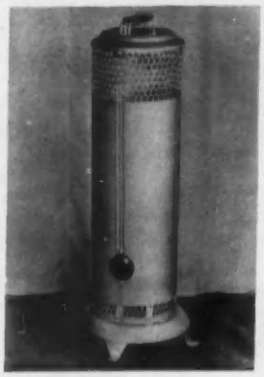
Introduced to meet the demand for a lower priced fixed temperature setting thermostat, the type TQB water heater thermostat has a prominent place on this stand. The electrical performance of this thermostat complies with B.S. 1555 and it is supplied with standard settings of 140° F, 160° F or 180° F. Other exhibits include stem type water heater thermostats, oven thermostats and "Simmerstats" and one-circuit, radiant boiling plates. No. 14.

Type "Y" time switch by Horstmann Gear Co. is an electrically wound model with reserve spring



This modified version of "3 to 7 AC" range of switches by Diamond "H" Switches now incorporates push-on "fast on" terminals instead of screw and clamp type

Right, the G.E.C. dual service immersion heater with its twin switch unit



The Gillott "Glow-warm" convector heater is loaded at 1 kW

The "Satchwell" VC thermostat meets a demand for cheaper units for water heater control

Telegraph Const. and Main. Co.

Polythene insulated power cables for voltages up to 11 kV are a feature of the wide range of "Telcon" cables shown on this stand. Also of interest is a polythene-insulated, three-core, aerial cable with catenary-suspension strand attached. Paper-insulated power cables for voltages up to 22 kV are shown with copper or aluminium conductors and lead or aluminium sheaths. "Telcon" plastic insulated wiring cables are also on view. No. 76.

Thorn Electrical Industries

Light in its relation to colour is the theme of this stand of the Atlas Lighting Division of Thorn Electrical Industries. The subject is treated with abstract settings in miniature illuminated by electronically-controlled fluorescent light. A further pictorial exhibit presents the specific use for each of six fluorescent tube colours in industry, commerce and the home. No. 96.

Tricity Cookers

The company's "Coronet" cooker, a popular-priced, family model incorporating automatic time switch control is the outstanding exhibit on this stand. A selling feature which is incorporated is claimed as "the exclusive feature of specially tailored ovenware, an entirely new idea in cooker design." The Tricity "Queen" and other models in the company's range of cookers are also on show. No. 62.

Tufnol Ltd.

Insulators made of "Tufnol" are shown in use here by the display of an Ellison 11 kV circuit-breaker, arranged for inspection of the interior. The electrical qualities of the material are further demonstrated by a terminal board of "Tufnel" sheet and bushings of "Tufnol" tube. Amongst other exhibits are insulators for telpher lines. No. 83.

Vactric Ltd.

Applications of the Vactric hand duster range from house to car and office. All these uses will receive attention in this exhibit, which also shows the company's floor polisher and full-sized vacuum cleaners. No. 42.

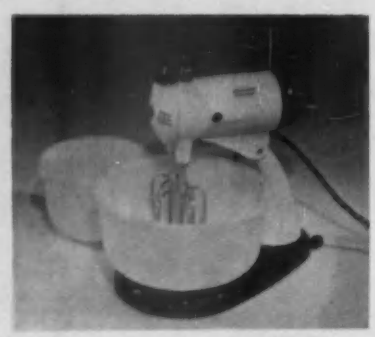
Henry Wiggins and Co.

Technical publications take pride of place here. Amongst recent Wiggin products on which data will be available is "Brightray H," the latest addition to the company's range of 80/20 nickel-chromium electrical resistance materials. It is suitable for operating temperatures of 1000–1250° C. Oxy-insulated "Brightray B" is a special grade whose oxidised nickel plating permits its use for close-wound tubular resistances. Finally, information is available on nickel and nickel alloys made by powder metallurgy techniques. No. 1.

Wilkins and Mitchell

Two washing machines are to be seen on this stand. The smaller model (S) takes 4 to 6 lb of washing, heats its water by a 2·3 kW heater, and uses an impeller for agitation of the washing. It is self-emptying. The larger unit, the "Cabinet Superheat" (model MHP) deals with 9 lb of washing, and has a 3 kW heater. There is a semi-rotary agitator, and the machine is self-emptying. Both

Smith's "Lynside" mantel clock is in walnut with gilt letters



Here is the Sunbeam "Mixmaster," a handsome electric mixer for the kitchen

Vactric's hand duster is ideal for upholstery.

The new Revo "Regent" cooker model 553 for modern cooking

machines are built in stove enamelled steel, with a chrome and rubber trim. No. 93.

Yorkshire Switchgear

Metalclad switchgear in the IVIO 6·6 and 11 kV range is on show here, together with fuse switches and motor starters for lower voltages. The outdoor exhibit comprises a two-panel board having an IVIO-13 circuit-breaker, fitted with the "Caton" arc trap and, in addition, a spring-assisted fault making/load breaking oil switch. The breaker is rated at 150 MVA, 6·6 kV and 250 MVA, 11 kV. The switchboard is mounted on a pre-cast foundation plinth of reinforced concrete slabs, which allow foundation work to be carried out by unskilled labour. No. 81.

NON-MANUFACTURING ORGANISATIONS

Supply Authorities and trade and other organisations associated with the industry are well in evidence at the Exhibition. Prominent is the Central Electricity Authority itself with an appropriately "futuristic" display featuring the generation of electricity from nuclear fission with the use of animated models and diagrams. Information and publications of general supply interest are also available from a kiosk on the stand. "Seeboard's" display highlights the advantages accruing from adequate wiring in the home, featuring, of course, the ring main system. The display is particularly pertinent in view of future supplies of electricity from atomic power and employs a fascinating revolving model.

Disseminating information of its organisation and selling flags during the week, the E.I.B.A. stand depicts the service offered by this lively organisation whose Sussex Centre is responsible for staffing arrangements. Representatives of the fair sex in the industry are seen on the E.A.W.'s stand, where attention is focused on the Association's work to bring electricity to the increased help of the housewife. For the contractor, the Brighton, Hove and District Branch of the E.C.A. illustrate the services afforded by Association members, particularly the Guarantee of Works and facilities offered for the adequate apprenticeship and training of juvenile labour.

In traditional style, the C.M.A. stand is instantly recognisable by its dominant "Roman Warrior" figurehead, created from the C.M.A. device which signifies cables made by members to the Association's high standards. Illuminated panels tell the story of the C.M.A.'s purposes and achievements. Recent developments in lamp performance and lighting practice are to be seen on the E.L.M.A.'s lighting service bureau stand. Special attention is focused on domestic lighting; with the indoor and outdoor lighting of flowers featured, whilst recent types of luminous and louvred ceilings are demonstrated. As will have been indicated in preceding pages, the British Refrigeration Association's stand comprises displays of the five member firms, each of which has already been described separately.

Equipment for Commercial Catering

Comparable in some measure with the refrigerator display is an exhibit indicating the variety and scope of electricity's contribution for the commercial catering industry. Some nine firms are showing equipment, described briefly below.

Carron Co.: A display of four units includes a 27·2 kW double-oven range and 4 kW grill. It is completed by a double compartment baking oven of 9 kW, and 20 gallon, 10 kW boiling pan.

EUK Catering Machinery: Prominent in this display of 6 equipments comes a two-tank, 7·5 kW dish washer, handling 1,000 pieces/hr together with a self-generating steam boiling pan of 10 gallons capacity and rated at 7·4 kW. Two ranges are also shown together with a 4 ft hot-closet/Bain Marie of 5 kW loading.

Gardiner and Gulland: The three items here comprise a 1·5 kW food conveyor, 5 kW "A-la-Carte" Bain Marie and hot-closet of 3·8 kW loading.

General Electric Co.: Three appliances are displayed, ranging from a 17·2 kW single-oven range of capacity some 60 persons, to a 16 gallon 3·7 kW stockpot. Other units include a single deck pastry oven for about 10 dozen smaller cakes or twelve 6 in. Madeira cakes; its loading is 4·5 kW.

Hobart Manufacturing Co.: A feature of this display is the semi-automatic dish washer handling 45 racks/hr. Its loading is 15 kW or 8 kW if a hot water supply is available. Three items of food preparation equipment complete the display, including a 20 quart, ½ h.p. general purpose mixer.

Jackson Electric Stove Co.: A two tier pastry oven is particularly noteworthy, handling 80–100 small cakes or scones on each tier and rated at 7·9 kW. Three sizes of hot-cupboard are offered, for 56, 18 and 8–10 plated meals respectively, and a 15·5 kW single-oven range is also on view, its capacity being 50–60 persons.

John Rouse (Oldham): In this display of appliances is offered a fish-frying counter range incorporating 2 pans and rated at 24 kW. For the kitchen are two potato peelers—handling 28 lb and 14 lb respectively and rated at ½ h.p. and ¼ h.p.

Simplex Electric Co.: Featured here is the 8 cu ft capacity, heavy duty unit type range, of 16·9 kW rating. The "6–16060" "People" range of 19·1 kW rating, 5·25 kW griller, and 2·1 kW hot-cupboard are also shown.

James Stott and Co.: To round off the display is this firm's show of eight appliances, which includes their "Connoisseur" cafe set, with cabinet, having a capacity of 210 pints/hr and rating of 12 kW. Two water boilers are offered—a 13 gallon/hr, 4 kW unit together with a wall model of the same rating delivering 64 pints/hr.

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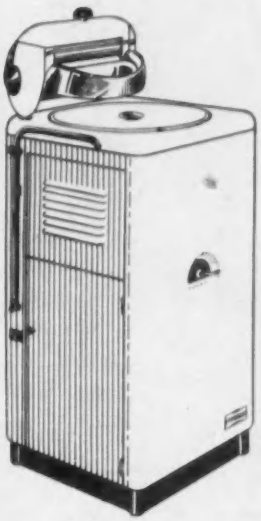

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Retail price:
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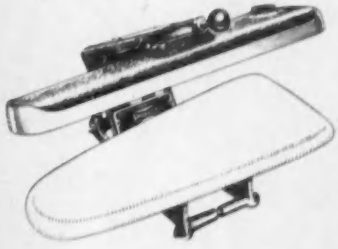

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POWER SUPPLY

Statistics for May

PLANT commissioning by the C.E.A. in May amounted to the not insignificant total of three boilers, aggregating 795 klb/hr evaporative capacity, and two sets, totalling 32 MW. Of the latter, a 30 MW unit is recorded at Fleetwood Generating Station (the first) in the North West, Merseyside and North Wales Division. Its commissioning was accompanied by that of the station's first boiler, a 300 klb/hr unit. Makers are English Electric and Simon-Carves, respectively. The same division also benefits from the other generator—a 2 MW diesel-driven unit for Kendal station, manufactured by Mirrlees, Bickerton and Day.

Further south, South Wales Division's Uskmouth Station records its tenth boiler. Like the previous nine, it is a 360 klb/hr unit of Babcock and Wilcox manufacture supplying steam at the "standard" t.s.v. conditions of 900 lb/sq in., 900° F. The remaining boiler is a 135 klb/hr unit for Cowes Generating Station, Southern Division. Of Daniel Adamson and Co.'s manufacture, its commissioning forms part of a extension plan involving two 12·5 MW Brush alternators. The only other item of plant recorded is that of a 100 kW compensation turbine, commissioned by the North of Scotland Board at Torr Achilty.

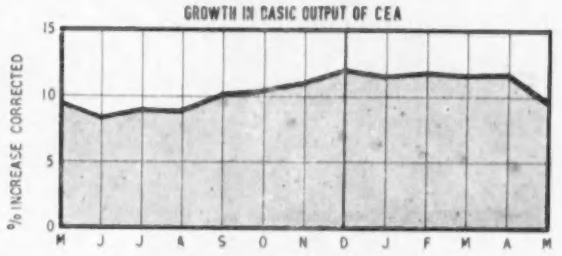
Installed capacity now stands at 19,017 MW for the C.E.A. (32 MW higher than at 30th April), 1,222 MW for the South of Scotland Board and 629 MW for the North of Scotland Board, the last two figures showing no change over the month. The total of 20,868 MW is 1,605 MW greater than at the end of May last year, an increase of 8·3%.

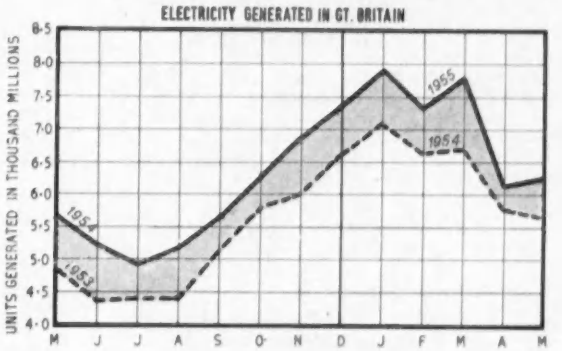
Energy sales by Area Boards show no sign of slackening off, each authority continuing to record substantial increases in its sales over the corresponding period last year. In terms of percentages, the increases range from the North Western Board's 7·5% to the South Western's 14·5%. Direct sales by the C.E.A. were again high—37·5% above those recorded in May last year. The grand total of sales by the Central Authority is seen to be 10·9% more than in May 1954. Average temperatures during May were somewhat lower this year than last, as were the number of effective working days, and, on correcting for these factors, the increase in sales is seen to have fallen to 9·7% which figure indicates the basic growth in load being experienced by the C.E.A.

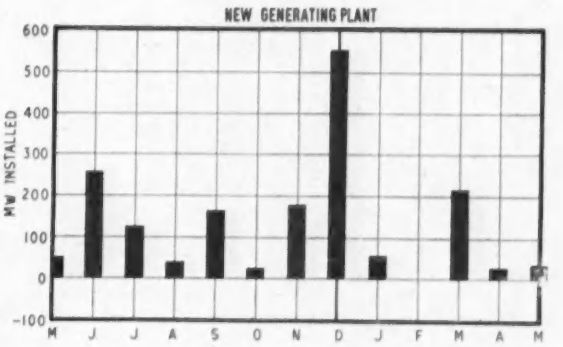
In all, some 6,214 million units were generated by all three Authorities, of which 6,102 millions were from steam stations, and 99 millions from water power. Of the total generated, the C.E.A. were responsible for 5,696 million units, the South of Scotland Board, 402 millions, and the North of Scotland Hydro Board 116 millions.

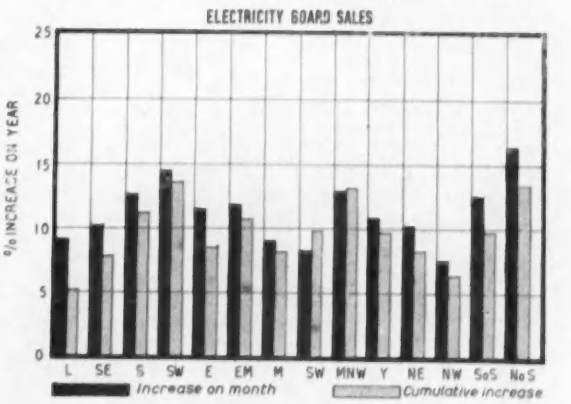
C.E.A. Sales to Area Boards in May

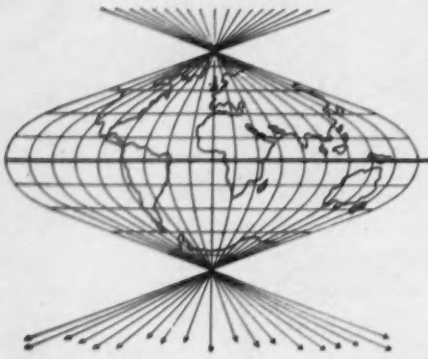
Area Board	May Sales in million units	%age inc. on May 1954
London	490·3	9·1
South Eastern	302·3	10·1
Southern	365·2	12·7
South Western	191·8	14·5
Eastern	498·7	11·5
East Midlands	435·0	11·8
Midlands	579·1	9·0
South Wales	352·2	8·3
Merseyside and North Wales ...	344·6	13·1
Yorkshire	570·1	10·9
North Eastern	336·9	10·2
North Western	614·2	7·5
Direct Sales by C.E.A.	128·6	37·5
C.E.A. Total	5,209·0	10·9
North of Scotland	92·3	16·3
South of Scotland	412·3	12·6











OVERSEAS NEWS

A SUMMARY OF IMPORTANT EVENTS

CANADA

Manitoba Plan

Faced with a power shortage and the need for more generating capacity, municipal officials of The Pas asked the Manitoba Power Commission to extend its transmission lines in order to supply the area. The appeal has been turned down, however, both by Mr W. D. Fallis, chairman of the Commission, and by the Province's Premier, Mr D. Campbell. Provincial officials have said it would be more economical for The Pas, facing a power shortage, to purchase a $100,000 diesel generating plant. To extend power commission lines would mean construction of a new heavier line north from Swan River, a distance of 150 miles.

Alberta Development

With unusually favourable water conditions calling for very low supplementary steam power during 1954, Calgary Power Ltd. reports a record net profit, which also reflects economic developments in Alberta, Mr G. A. Gaherty, the president, reports. The company placed into operation last year its new 22,000 h.p. Bearspaw plant and a 30,000 h.p. extension to the Ghost plant. Work is now going ahead on construction of the Pocaterra Interlakes power and storage development at the head of the Kananaskis River, which should be completed this year. The company is also building a steam plant with an initial capacity of 66 MW adjacent to a strip coal mine beside Lake Wabamun, 40 miles west of Edmonton, Alberta. Initially this plant will be fired by natural gas but provision is being made for coal firing equipment should this later be desirable.

Record Domestic Consumption

Once again the domestic consumers in Winnipeg have achieved a new record in their average annual consumption of electricity. The annual report of the Winnipeg City Hydro undertaking for 1954 shows that consumption of the 55,580 domestic consumers served by the utility increased to 7,224 units last year compared with 7,037 units in 1953. They thus contributed materially to the $6,465,345 profit of the undertaking, although Mr T. E. Storey, the general manager, explains that with a very satisfactory river flow, the hydro-electric output almost entirely met the power demands. A decision is expected soon concerning the work to be carried out at the Pointe du Bois power station on the Winnipeg River where the plant has exceeded its economic life. Meanwhile the capacity of the Amy Street steam station was raised to 51,000 kW by the installation of a further 25,000 kW set and associated boiler plant. It is stated that the agreement under which the city will acquire the distribution properties of the Winnipeg Electric Co. within the municipal boundary should simplify and improve the operation of the department, as well as improving the financial position.

Traction Order

In the repeat order for 34 more cars by the Toronto Transit Commission, to which we referred last week, these additional all-steel coaches will be equipped with B.T.H. electro-pneumatic camshaft control equipment.

AMERICA

Power for Fertiliser Plant

As part of the Venezuelan Government's plan to develop the country's natural gas resources, plans have been prepared for a chemical fertiliser plant which will require a 5,000 kW electric power plant. The authorities hope to have the plant in operation by the end of 1957, and it is expected that tenders will shortly be invited from individual firms overseas. An Italian concern was given the contract for preparing the specifications for the chemical fertiliser plant.

Development with Nationalisation

The privately-owned Compania Electrica de Santo Domingo, formerly a subsidiary of an American power corporation, was formally taken over by the Dominican Government earlier this year, the purchase price being financed by an issue of bearer bonds. It has been stated that electricity consumption in the Dominican Republic has increased from 39·9 million units in 1948 to over 100 million units last year, and with a view to expanding the Republic's economy plans are being drawn up to increase the electricity generating capacity. Firstly, it is proposed to utilise the natural water resources by the construction of hydro-electric plants. To this end, hydrographical surveys are being made of the Rivers Nizao and Yaque del Norte, including the tributaries Jimenoa, Bao and Mao. It anticipated that such work will be pushed ahead as quickly as possible, as the country's industrialisation programme will shortly need additional power supplies.

FINLAND

Big H.E. Plan

An ambitious hydro-electric project, which it is expected will take about 15 years to complete, is being planned in Finland. To be known as the Kemijoki project, it would utilise the waters of the Kemi, Finland's principal waterway, and its subsidiaries. It is suggested that some 30 power stations could be built, in addition to the two large ones already operating there, to provide an annual output of about 5,000 million units. Five dams would probably be built to provide large reservoirs and to control the flow of the Kemi River which at present fluctuates considerably. The plan is regarded as ambitious, and will involve extensive civil construction work, but with a dearth of natural fuel resources Finland could well proceed with such a scheme. It would in addition necessitate the erection of lengthy transmission lines in order to provide the power in the industrialised southern areas.

EUROPE

Increasing Costs

Under revised estimates for Portugal's six-year plan, an additional £3m is allocated for the Picote hydro-electric station on the River Douro, and a further £3m is to meet the increased cost of the power stations at Conicada and Paradela. Another £2½m will be absorbed by transmission lines and a further £2m by local distribution network.

Austria's Loan

A 25-year loan to Austria chiefly in European currencies, equivalent to $10 millions, has been approved by the World Bank for the Lunersee hydro-electric project in Vorarlberg. This project, which is scheduled to be completed by the end of 1958, is a pumped storage hydro-electric scheme, which is expected to earn about £500,000 a year from power exports to South-West Germany. Situated near the Swiss frontier, the

Lunersee project utilises an inland lake on the northern bank of which a dam with a maximum height of 34 metres is being constructed. The new power station, situated near the existing Latschau generating station, is to have four 40 MW sets, the output of which are to reach 214 million units annually.

S. AFRICA

Electrification Contract

A contract valued at £7,219,827 has been placed by the South African Railways and Harbours Administration with the Metropolitan-Cammell Carriage and Wagon Co. Ltd., for the supply of 349 railway coaches for use on the Reef electrified line. Delivery is to commence within 21 months at a rate of about twenty a month. The main sub-contractors for the electrical equipment are Metropolitan-Vickers Electrical Co. Ltd. The contract was won in the face of strong competition from Holland, Germany, Switzerland, Czechoslovakia, Italy, France, Canada and Belgium.

Railway Plan

The South African Railways have a five-year plan of development for the Natal North coastline. In regard to Durban in particular, the Railways are awaiting finality on the city's £10m native housing scheme at Duff's Rd, when consideration will be given to a double-line electrified railway with four new stations about a mile apart serving the township.

INDIA

Traction Order

An order for electric traction equipment to the value of approximately £900,000 has been placed with Associated Electrical Industries (India) Ltd. by Jessop and Co., Ltd., who are supplying 104 railway coaches for broad-gauge multiple-unit trains for the Calcutta electric suburban service. The passenger coaches are to be made in India for the first time, we understand. The new rolling stock will comprise 34 three-coach units, each consisting of two drawing trailers with a motor coach between. Two spare motor coaches have also been ordered. The bulk of the electrical equipment will be made by Metropolitan-Vickers Electrical Co., Ltd., at their works at Sheffield and Trafford Park. About one-tenth will be manufactured in India by A.E.I. Manufacturing Co. Ltd.

AUSTRALIA

S.A.'s Outlook

Notwithstanding its enormous development, the Electricity Trust of South Australia would make a substantial profit in the current financial year and in due course would be able to reduce its charges, Mr Playford, the Premier, stated recently. He also forecast that the Trust would be turning its attention to nuclear power in 1960 or 1962.

NEW ZEALAND

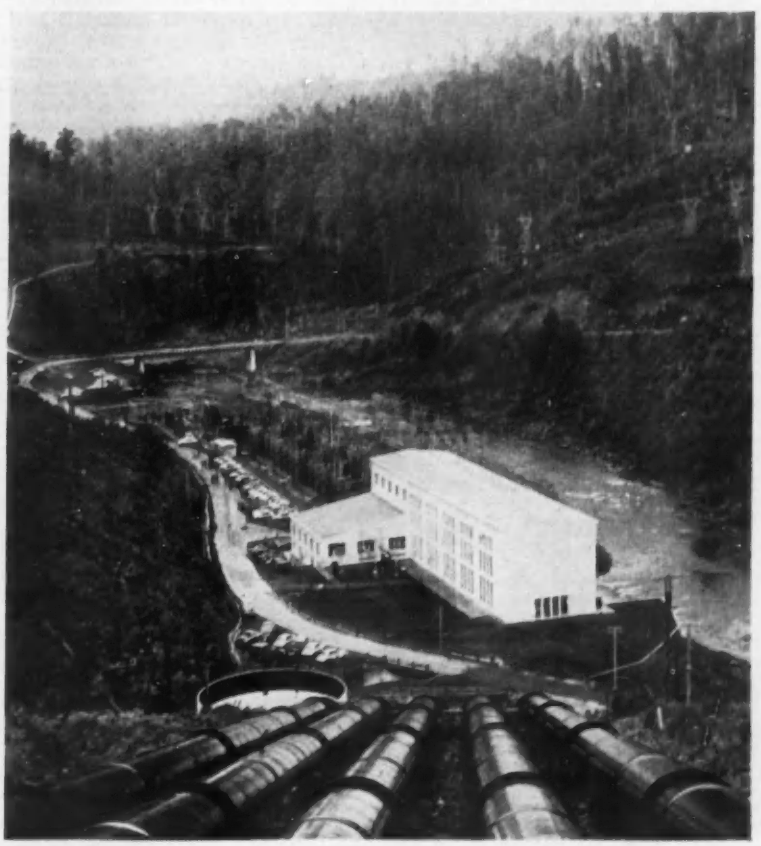
Consumption Statistics

Units sold per consumer in New Zealand during the year ended 31 Mar. 1954 amounted to 5,014—an increase of 449 units, it is shown in the annual statistics just issued by the State Hydro-Electric Department. With 98·74% of the total population of the Dominion within the areas of supply of the various undertakings, electrification has reached a very high degree. Total number of consumers amounted to 643,777—an increase of 21,338 during the year, and 23,719 electric cookers and 26,927 electric water heaters were installed, in the period. For some of the smaller power boards the statistics are highly illuminating. The Te Awamatu Power Board, for instance, has 4,760 consumers of whom over 84% have electric cookers and 69% water heaters, while the Hawkes Bay Power Board has 14,976 consumers of whom over 74% have cookers and 62% water heaters. In contrast, of the Marlborough Board's 6,000 consumers only 33% have cookers and 24% water heaters.

No Increase

The Auckland Electric Power Board is not to follow the move of the Waitemata Electric Power Board which (as we reported last week) is raising tariffs to provide a fund for capital works. Mr N. M. Speer, general manager of the Auckland Board said it would be necessary to increase charges by 33⅓%, and this he was against even though the board was overdrawn £476,000.

Tungatinah hydro-electric station, Tasmania, which was formally opened by the Governor-General, Sir William Slim, on 20 May, now has four 25 MW sets on load, with a fifth shortly to be added. The station is fed with water from reservoirs and diversions controlled from a number of dams with heights of up to 120 ft. The final path of the water to the station is a tunnel through the surrounding hills, and five steel penstocks each 3,200 ft long and of 90 in. max. dia., seen in the foreground of our illustration below. The alternators for the station have been supplied by the General Electric Co., Ltd., and the Francis type water turbines, which operate under a static head of 1,005 ft, by Boving and Co., Ltd. They are designed for an overspeed of 1,050 r.p.m. The transformer installation comprises fifteen single-phase units each of 10 MVA, manufactured by the Brush Electrical Engineering Co., Ltd., which are arranged in five 3-ph. banks, stepping up the voltage to 110 kV. The arrangement of s.ph. units was adopted because of the difficulty of transporting 3-ph. units to a site 2,000 ft above sea level and at the bottom of a relatively narrow gorge with steep approaches. (For this reason the stators were also split and despatched in two parts.) The l.v. sides of the transformers have delta connections, with star connections on the h.v. sides. The units are of the standard Brush core type design, oil-immersed and naturally self cooled



Personalities IN THE INDUSTRY

Due to arrive in Britain on 25 June is **Mr E. P. Swan,** deputy chief engineer and manager in the Ceylon Government's Department of Electrical Undertakings. As one of many trainees from South and South East Asia here on courses arranged under the Technical Co-operation scheme of the Colombo Plan, Mr Swan is on 3½ months course in Britain, one month of which will be spent with the North of Scotland Hydro-Electric Board, from where he will go on to the Central Electricity Authority's educational and training branch in London.

Dr C. Dannatt, O.B.E., M.C., managing director of Metropolitan-Vickers Electrical Co., Ltd., and **Mr O. W. Thesiger,** deputy managing director of Associated Insulation Products Ltd., have been appointed directors of the Micanite and Insulators Co., Ltd.

Appointed as commercial officer of the Dumfries and Galloway sub-area of the South of Scotland Electricity Board is **Mr Reginald J. Wills,** A.M.I.E.E. He gained early experience with Crompton Parkinson Ltd., and Fulham Borough Council Electricity Department, and after a period with the Southern Electricity Board, was in 1953 appointed district commercial engineer of the Annan district of the former South West Scotland Electricity Board.

Mr H. C. Van de Velde, who has held senior executive posts in Marconi's Wireless Telegraph Co., Ltd., and the Marconi International Marine Communication Co., Ltd., for 36 years, is to relinquish his present position as deputy to the managing director of the Marconi Marine Co. on 30 June. **Mr R. Ferguson,** who has been general manager since Jan. 1947, will in future extend the scope of his responsibility for the company's affairs as senior executive. Mr Van de Velde's services will still be available in a consultative capacity, with particular regard to the company's business abroad, and he will continue to represent the company on the boards of directors of various associated companies overseas, while he will also maintain his association with the Comité International Radio Maritime and the Radio Marine Associated Companies, of which international bodies he is at present president and chairman respectively.

Mr Alexander MacKenzie and **Mr T. R. Ragland** have been elected directors of Bakelite Ltd. **Mr G. C. Miller** and **Mr L. K. Merrill** have left the board of the company.

At present deputy station superintendent at Derby power station, East Midland Division, C.E.A., **Mr C. D. Heath,** A.M.I.E.E., has been appointed to a similar post at the Portishead "B" power station, South Western Division, with effect from 11 July. Mr Heath served an apprenticeship with the English Electric Co., Ltd., and studied at Stafford Technical College. After war service, he returned to the company, taking a full time course at Walsall Technical College, and in 1947 became charge engineer at Stafford generating station. There followed five years at Meaford power station, holding various appointments, including those of charge engineer, and electrical maintenance engineer. In Sept., 1953, Mr Heath went to Derby power station as deputy station superintendent.

After 48 years' service in the Electrical Industry, **Mr P. G. Lloyd,** A.M.I.E.E., steam testing engineer with the North Eastern Division, C.E.A., has retired. Educated at Caldy Grange Grammar School, the Holt School of Science, and Birmingham Technical College, Mr Lloyd started his career at Hoylake and West Kirby Electricity Works in 1907 where he was charge engineer for two years, following three years as a pupil. He had a short spell with Chamberlain and Hookham Ltd., and in 1912 he joined the Newcastle upon Tyne Electric Supply Co., Ltd. (subsequently the North Eastern Electric Supply Co., Ltd.), as technical assistant in the Test Department, with whom, apart from three years in the Royal Engineers during the First World War, he remained until vesting day, when he became the steam testing engineer of the North Eastern Division. Many of Mr Lloyd's old friends and colleagues were present when **Mr J. C. Mitchell,** Divisional Controller, recently presented him with a silver salver and a barograph to mark the occasion of his retirement.

Changes in sales representation are announced by William McGeoch and Co. Ltd. **Mr R. W. F. Ell,** formerly with Lancashire Dynamo Switchgear Ltd. is to be senior sales representative in the London area, which includes the counties of London, Middlesex, Surrey, Kent, Sussex, and parts of Hants, Berkshire, Oxfordshire, Buckinghamshire, Hertfordshire, Essex and Wiltshire, and he is also to be in charge of the London office. **Mr G. E. Moore,** late of Tuscan Engineering Co., Ltd., and **Mr C. K. Heffernan,** previously with George Becker Ltd., are to be assistant sales representatives in the London area, Mr Moore for the Eastern Section and Mr Heffernan for the Western Section. In addition, **Mr W. O. Scofield,** formerly with Crypto Equipment Ltd., is to be sales representative in the South West area in place of **Mr J. L. Lovell,** who has been appointed to look after the company's government interests in the area.

To mark the completion of fifty years' service with David Brown and Sons (Huddersfield) Ltd., **Mr Arthur Sykes,** B.SC., WH.EX., M.I.MECH.E., M.I.P.E., M.S.A.E., technical director of the company, was recently presented by his fellow directors with an engraved silver rose bowl. The presentation was made by **Mr A. Avison,** a director of the David Brown Corporation Ltd., and general manager of the David Brown Gear Group. Earlier, the executive staff of the company presented Mr Sykes with a crystal water set.

Boilerhouse superintendent at Ferrybridge power station, Yorkshire Division, C.E.A., since 1953, **Mr G. Johnson** has been appointed deputy station superintendent at Portsmouth generating station, Southern Division, in succession to **Mr R. Lawrence,** A.M.I.E.E., who has retired. Mr Johnson gained early experience with the West Midlands Joint Electricity Authority with whom he was engaged on

Mr H. C. Van de Velde

Mr R. Ferguson

Mr P. G. Lloyd

Mr. D. H. Leeson

Mr H. H. Daker

Mr R. C. Nash

distribution work, substations and underground mains extensions. He subsequently transferred to the generating side in 1939, and became control room assistant at Ironbridge power station. After further experience at Walsall and at Ocker Hill, where he was charge engineer, he was at the Bromborough power station before going to Ferrybridge in 1953.

Chief radar engineer to Kelvin Hughes (Marine) Ltd., **Mr H. R. Whitfield,** M.I.E.E., has been appointed a director of that company.

Mr D. H. Leeson, M.A.(CANTAB.), A.M.I.E.E., G.I.MECH.E., has this week joined Crompton Parkinson Ltd. as home sales manager of the company's associate switchgear concern, Cooke and Ferguson Ltd. Educated at Uppingham and King's College, Cambridge, Mr Leeson is already a well known figure in the switchgear industry as a result of his services hitherto with A. Reyrolle and Co., Ltd. Having received his student training with that company, he subsequently held increasingly senior positions in the Contract Department, serving for a number of years with the outside contracts staff in Leeds and, more recently, as deputy to the area manager in Nottingham. Under his new appointment with Cooke and Ferguson Ltd., Mr Leeson will operate from Manchester.

Three young Malayan electrical engineers, in this country under United Nations' scholarships to study recent developments in the communications field, have just completed a fortnight's visit to the Liverpool works and other installations, of the Automatic Telephone and Electric Co. The visitors, **Mr Phooi Thong, Mr Say Hai,** and **Mr Ah Thow,** all of whom are employed by the Malayan Post and Telegraphs Department, were shown some of the latest types of automatic exchange and carrier equipment. They also saw modern production methods in use at the factory. Mr Phooi is employed as a technical assistant on the multi-channel carrier side; Mr Ah Thow is a technical assistant in charge of Ipoh exchange and telegraph office, and Mr Say Hai, a duty officer.

Mr M. J. Mortimer, M.I.E.E., Worthing district manager to the South Eastern Electricity Board, whose impending retirement on 28 July we briefly noted last week, received his technical training at the Central Technical Schools, Leeds, the Leeds University and the Liverpool Technical Schools. He was apprenticed to the Midlands Railway Co. at Leeds, and was afterwards employed in that company's generating stations at Bradford, Leeds and Heysham Harbour. He subsequently held appointments in the power stations of the Bury Corporation, the Mersey Railway Co., and the Yorkshire Electric Power Co. (Thornhill station). In 1918 he became station superintendent at Aylesbury, and two years later was appointed chief assistant engineer at Chelmsford. He went to Abertillery in 1921 as engineer and manager of the Urban District Council's undertaking and remained there until 1928, when he took up the position of borough electrical engineer at Morecambe and Heysham. He became "chief" at Loughborough in 1932, and four years later went to Worthing in a similar capacity. **Mr Kenneth Davis,** who has been appointed to succeed Mr Mortimer, was born in Gravesend in 1911 and was educated at Eastbourne College and Erith and Birmingham Technical Colleges. After practical training with Fraser and Chalmers Engineering Works at Erith, and the General Electric Co., Witton, he came into the Supply Industry in 1933 when he joined the staff of the E.D.A.S.T.—a subsidiary company of the G.E.C. In 1935 he was appointed assistant mains engineer with the Electricity Co. of Macclesfield. In 1937 he became assistant resident engineer of the Shoreham and District Electric Lighting and Power Co. and a year later was promoted to resident engineer and manager, a position he held until nationalisation when he became the Shoreham manager. In 1950 the Worthing, Shoreham and Littlehampton districts were amalgamated and he became deputy in the new Worthing district.

A sign designer employed by Franco Signs Ltd., **Mr G. A. Hammond,** has been awarded the prize offered by the Electrical Contractors' Association for the winning entry in a sign design competition. In this, competitors had to design a window display sign which could be interpreted in various forms. Mr Hammond's winning design incorporated the Association's "Safe Hands" symbol.

For the second time within a few months a B.T.H. ex-apprentice has gained a distinction in the award of the Cane of Honour, presented to the best cadet of each unit. A similar award was made to **Second-Lieut. T. L. Clarke** last March, and the honour has now been achieved by **Second-Lieut. R. M. Q. Jeffries,** who completed his Student Apprenticeship with B.T.H. last August, and at the time of leaving for National Service was a member of the Personnel Department at Rugby Works.

From British Insulated Callender's Cables Ltd. we learn that **Mr H. H. Daker,** B.SC., A.M.I.E.E., C.P.A., has been appointed as patents officer in succession to the late Mr R. L. Cleaver. Mr Daker was educated at Queen Mary's Grammar School, Walsall, and afterwards served a three-year apprenticeship with Cannock Chase Colliery at the end of which he was awarded a scholarship to Birmingham University where he obtained a First Class Honours Degree in Electrical Engineering.

In 1926 he joined British Insulated Cables Ltd. as an assistant superintendent in their Contracts Department. In 1929 he transferred to the Patent Bureau of Cable Research as a technical assistant, rejoining B.I.C.C. as a member of the Patents Department in 1948. In February, 1953, he was appointed assistant patents officer, a position which he occupied until his present appointment.

Edwin Danks and Co. (Oldbury) Ltd., announce the retirement of **Mr R. C. Nash.** Mr Nash joined Babcock and Wilcox, in 1910 and transferred to Edwin Danks in 1924 to take charge of the Estimating Department. He was appointed chief assistant to Mr J. Smith, the managing director, in 1943 and has served in that capacity until the present, when ill-health has forced him to cease active participation in the affairs of the company. His services, will however, be available for special duties.

Thorn Electrical Industries Ltd. announce further changes in the sales organisation of the Atlas Lighting Division. **Mr E. W. King,** former area sales manager, Midlands Area, is being transferred to head office to work directly under the general sales manager on a special assignment in connection with large industrial users. Other changes include the division of the London Area into two parts with **Mr R. S. Gowing** as area sales manager, London area north, and **Mr M. J. Donaghy** as area sales manager, London area south. **Mr L. A. Moir** will assume responsibility for dealing with large wholesalers with head offices in the London area.

Works manager of the Hartlepools and Spennymoor factories of Siemens Bros. and Co., Ltd., for the past eight years, **Mr C. J. Lever,** M.B.E., has retired in order to devote himself to specialised work only, we understand. His successor is **Mr. P. Scudder,** who has served for 30 years at the firm's Woolwich factory.

In Stockholm, last Saturday, delegates from the 37 member countries of the International Organization for Standardization (I.S.O.), elected as their fourth

president, **Sir Roger Duncalfe,** well-known industrialist and President of the British Standards Institution. Sir Roger will hold the Presidency for three years from 1 Jan. next.

After forty-three years' service with the British Thomson-Houston Co.—all of which has been spent on the design of electric control gear—**Mr. L. Wise** has retired. Following an apprenticeship at an ironworks and periods with the Sunderland Forge Co. and the Jandus Arc Lamp Co., Mr Wise first joined B.T.H. at Rugby, in the control gear drawing office, but subsequently left the company to work elsewhere for a short time. He rejoined B.T.H. in 1923 and until his retirement was engaged in the control gear engineering department. Mr Wise's many friends in the company contributed to a parting gift, which was presented to him by **Mr K. R. Hopkirk,** director and chief mechanical engineer.

Engineer and manager (Scotland) for Johnson and Phillips Ltd., **Bailie Bruce Russell,** M.I.E.E., has been appointed a member of the South of Scotland Electricity Consultative Council. Bailie Bruce Russell is senior magistrate for the City and Royal Borough of Edinburgh.

In appreciation of his services in operating the Avington Electricity Supply (a non-statutory undertaking) the inhabitants in Itchen Valley have presented a cheque to **Mr J. Legg,** who went to Itchen Abbas in 1923 to convert an existing flour mill into a power station originally to supply Avington House, and later extended the supply in the Itchen Valley. The undertaking has now been taken over by the Southern Electricity Board.

Mr E. Basil Green, formerly managing director and deputy chairman of Doulton and Co., Ltd., has been elected chairman of the company.

Dr A. Parker, C.B.E., D.SC., director of the Fuel Research Station of the D.S.I.R. at Greenwich, has been elected chairman of the council of the Royal Sanitary Institute.

OBITUARY

Mr A. R. Dunton, M.I.E.E., who was for many years a research engineer with the Metropolitan-Vickers Electrical Co. Ltd., has died at Paignton, aged 89. He was a specialist on electrical insulation matters, and did much pioneer work on the use of plastics in engineering.

Mr J. G. Wilson, M.I.E.E., who died at Brora, Sutherland, on 16 June, was for some years with the Westinghouse Electric International Co. Ltd.

Mr E. V. Hudson, formerly proprietor of C. H. Byron (Electrical) Ltd., died on 16 June, aged 77.

Dr J. M. Macaulay, B.SC., PH.D., A.M.I.E.E., formerly of the Royal Technical College, Glasgow, died on 16 June.

Mr L. G. Vedy, C.B.E., assistant secretary, Minister of Fuel and Power, died on 18 June.

NEW LITERATURE

Trades Register of London

CLAIMED to be the most up-to-date record of London trades, this 1955 edition, just published, contains more than 50,000 classified names and addresses, including many new ones, ranging from abattoir equipment to zinc sheets. The electrical industry is well represented, classified under various headings, and from this it would seem that the directory gives a very good coverage. The publishers state that in checking the lists numerous address alterations had to be made. Strongly bound to withstand frequent use this volume should prove of value to sales organisations and those seeking lists of suppliers. Published by Kemp's Printing and Publishing Co., 612 pages, 9½ in. by 7⅛ in., price £3. 3s.

Generation and Transmission

by C. S. Beckett, B.SC., A.M.I.E.E.

IN these days of generally expensive textbooks it is pleasant to note the reappearance in a new and up-to-date edition of a reasonably priced volume intended for the degree standard student. The approach is essentially descriptive, and although the mathematical derivation of essential transmission formulæ is given, this section of the work is kept to a minimum.

The first part of the book gives a straight descriptive treatment of the steam side of a power station, and gives an excellent brief résumé of current practice for the electrical student. Switchgear, which comes next, receives rather abbreviated treatment in the main part of the book, but this is now expanded in an appendix. The section on transmission equipment follows the usual pattern, including a treatment of vector diagrams and notes on cables and protective gear. Published by Blackie and Son, 124 pages, 8¼ in. by 5¼ in. Third edition. Price 8s. 6d.

Electrical Engineering Problems

by F. A. Benson,
M.ENG., PH.D., A.M.I.E.E.

TEXTBOOKS commonly provide a brief selection of numerical problems associated with the subjects discussed within them, but they seldom provide more than the bare answer. The present collection of 264 questions, arranged in 44 papers of similar subjects, aims to fill this gap for the student working on his own, and for teachers who wish to have a wider range of readily prepared problem papers. Full workings are given to each problem, placed separately so that the student is not distracted from an attempt to work out his own answer.

The standard of student provided for is the first year post-intermediate undergraduate, and the questions are kept rigidly at this level. Machines, measurements and electronics are covered as well as basic electro-technology. It is necessary to note that, of purpose, the answers to problems do not attempt to replace or strongly supplement textbook or teacher; rather, they show the student who has tried to produce a solution and "got stuck" the way to continue. The book should serve its purpose well, for it is clearly laid out, and these diagrams are freely used where they forward a solution. Published by E. and F. N. Spon. 8½ in. by 5½ in. Price 25s.

Magnetic Alloys and Ferrites

ed. M. G. Say, PH.D., M.SC., M.I.E.E.

IN recent years the whole subject of magnetism has shaken off its strongly empirical background and become closely integrated with basic scientific theory. This is reflected in the present excellent survey of the composition, properties and application of magnetic materials in electrical engineering. A good start is a help to any book, and this one gets away well with a clearly presented outline of present ferromagnetic theory which provides an essential background to the understanding of the rest of the book. The writing here is kept at about engineering degree level, and should be welcomed by many who wish to bring up to date their understanding of this rapidly developing branch of science.

The main part of the book deals in order with soft magnetic materials, permanent magnetic materials (including ferrites), non-magnetic and compensating alloys, and magnetic materials for electronic applications. In all cases, there is a brief review of the research and development activity that has led to the present position, a tabular and graphical review of properties of available materials, and notes on applications and associated topics. Published by Newnes in their "Electrical Engineering Progress" Series. 200 pp. 8½ in. by 5½ in. Price 21s.

BOOKS RECEIVED

A Guide Book to Electricity by J. H. M. Sykes. Intended for the intelligent layman and ranges in scope from generation and transmission to telecommunications. Published by Hutchinson, 275 pages, 9 in. by 6 in. Price 21s.

Magnetic Amplifiers by Dr H. F. Storm. Largely for design engineers, presenting theory of operation together with data on core materials and manufacturing techniques and metallic rectifiers and a wide variety of applications. Published by Chapman and Hall, 545 pages, 9 in. by 6 in. Price 108s.

Work Study in Theory and Practice. Summary of eight papers read at the B.P.C. work study conference in Mar. this year, ranging from human problems to applications to particular industries. Published by the British Productivity Council, 21 Tothill St, S.W.1, 32 pages, 9 in. by 6 in. Price 9d.

Storage Batteries by G. W. Vinal. Largely rewritten edition reflecting recent technological advances in battery design and construction. Fourth edition, published by Chapman and Hall, 446 pages, 9 in. by 6 in. Price 80s.

PROBLEMS AND PRACTICE

In Engineering

Every engineer has a story to tell; why not tell yours on this page? We welcome contributions to this feature, and those published will be paid for at our standard rates. Problems which are encountered and overcome in day-to-day maintenance or installation of electrical plant; useful methods and techniques developed for specific jobs, or current practices, all make instructive reading for others. We will also consider for publication problems requiring an answer. Sketches are often helpful and need only be rough, as they will be redrawn before use.

Boiling Bars

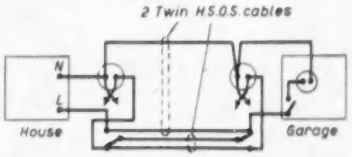
MARCH, 1947, was a time of sudden thaw and floods, and during one particular night the ammeter of a 6·6 kV three-phase feeder supplying an industrial consumer began to show a load that was unusual. Starting at zero the pointer slowly crept up to 40 to 50 A (say 500 kVA). By the early hours the duty man could stand it no longer and roused the nightwatchman at the plant, who was soon back on the phone to say he could not see the substation for steam.

Investigation, after isolation by the Company's engineer, showed that the bare copper bars carrying the l.t. output from the transformer ran through a trench which was flooded by the nearby river, and as the water level rose so did the load on the feeder. Drying out from the effects of the condensation of steam took a few days, but there was no serious damage.—*K. S.*

Two-Way Circuit

HAVING read the recent correspondence on two-way switching, I thought perhaps your readers would be interested in a circuit which I devised to enable a customer to switch on one lamp outside his garage and another outside his house with one two-way circuit. He also required a light point inside the garage, controlled independently.

The garage was situated about one hundred yards from the house from which



Two-way circuit arranged to supply two lamps

the circuit was to be fed and the wiring was to be overhead. It was desired to keep the cable costs as low as possible.

By using the circuit detailed above it was possible to use two twin h.s.o.s. cables with the necessary junction boxes situated inside the buildings.—*H. Gray.*

Fractured Cage

THE simplicity of a squirrel cage motor is such that trouble rarely occurs and when this does arise site conditions are often responsible. A case recently investigated concerned a 5 h.p., 1,430 r.p.m. s.c. machine which, when installed, "worked perfectly" and then after a short time starting became more and more difficult and noisy. There had been no alteration to the driven equipment which was via a gear drive with the pinion mounted direct on to the motor shaft.

Starting certainly was difficult and this was traced to the rotor which had a cage constructed of copper bars brazed to endrings. Quite a number of bars were completely fractured at a point where they joined the endrings although there was no case of any of the brazed joints having failed. With the initial failure of the bars the trouble had been cumulative as further bars fractured.

After fitting a new cage the motor was re-installed when it was found that the vibration transmitted to the motor from the gears was very bad and this had no doubt caused the rotor cage to fail. The gears were given attention to reduce the vibration otherwise the new rotor cage would soon have shown signs of similar distress.—"*Torque.*"

Switched Sockets

DURING my visits to consumers' premises, I frequently find switched socket-outlets with the switch connected in the neutral, particularly in old installations. In new installations, it is rare to find this error, but I am surprised to find many double-pole switched socket-outlets connected with the neutral and phase reversed. Careful examination of the switch-socket is necessary to identify the correct l. and n. terminals, as the different designs of various manufacturers result in different positions for these terminals. Often the only indication is a minute "L" or "N" moulded into the base.

It is, of course, essential that the live and neutral conductors are connected to the correct socket tubes, in order to ensure that any switch on the appliance being used, is connected to the live lead. With so many modern appliances made with local or automatic switches, it becomes dangerous if this switch is connected in the neutral, particularly with such appliances as toasters and hair dryers where the element can be easily touched. Apart from the danger, very strange effects may be produced under fault conditions.

I was recently in a hairdresser's establishment and was asked if I would examine a socket-outlet, as whenever the hair-cutting machine was used in this outlet, it blew a fuse, whereas it worked all right in an adjacent outlet. On examining the supposed faulty socket-outlet, which was of the d.p. type, I found it in perfect condition, with all connections correct, but the socket-outlet which did not blow the fuse, had l. and n. leads wrongly connected. I had great difficulty in persuading the proprietor that the apparently correct plug was, in fact, the faulty one.

I asked to see the hair-cutting machine, which he insisted was working all right except that the thumb switch would not work. A quick test revealed a fault to earth, and further examination disclosed a faulty suppressor capacitor on the switched side of the motor. As this switch was connected in the neutral in the wrongly-connected socket-outlet, it was virtually short-circuited by the faulty capacitor, but when used in the correctly-connected socket-outlet, the fault was imposed on the live-side, and of course, blew the fuse. After removing the faulty capacitor, the machine worked both outlets. I afterwards reconnected the faulty outlet correctly and advised the proprietor to return the machine to the manufacturers to fix new capacitors.—*W. T. Wedlake.*

Two-Way Switches

IN his contribution of 19 May, Mr Wedlake raises points of interest to installation engineers by his comments on the difficulty of replacing surface type 2-way switches due to the common terminal being in the wrong position. His method of making up switches with two common terminals is ingenious but I am afraid is hardly applicable to the entirely different positioning of the terminals in the modern micro-gap switch.

Replacing and fitting intermediate switches—even although not yet designed for micro-gap action—similarly presents problems, as some manufacturers allow for crossing of the strapping wires, while other makers (without notification) fit the crossing integral with the switch.

The point concerning two common terminals in the cheap unbranded type is allied to the now old-fashioned switch-socket which had an additional terminal and simplified the use of a pilot lamp with the apparatus controlled. With the micro-gap switch-socket, the only way to run a pilot lamp is by means of soldering a lead; it is difficult to make a clean job. If technically trained craftsmen were on the staff of manufacturers, replacements and flexibility in the use of accessories would be facilitated.—*M. N.*

Faulty Contactor.—On the experience of a sticking contactor described last week by Mr H. Allen in the "Industrial Maintenance" section we have been reminded by Mr J. G. Potter that a simple method of ensuring a small air-gap between contactor faces had been suggested by him in "Problems and Practice" in our 15 July, 1954, issue.

Equipment for Industry

Protecting 3-Phase F.H.P. Motors

TAKING advantage of the unbalance caused in the circuit of any three-phase motor due to either a winding fault or supply unbalance, the ENGLISH ELECTRIC CO., LTD., Marconi Hse, Strand, W.C.2, have recently introduced a comprehensive protection system for three-phase f.h.p. motors which is likely to have a wide appeal in industry. Use of the system requires star wound motors in which the star point has been brought out since a trip element is inserted in the connection between this point and the supply neutral. The neutral trip element is incorporated in the motor starter as an addition to the three line o./l. trip elements, being arranged to actuate the common trip bar. A four-pole contact arrangement is employed completely to isolate the motor from its supply.

On motors less than ½ h.p., and where no-volt protection is not required, full protection against overloads, earths, short-circuits, and single phasings can be provided by a small unit employing thermal o./l. elements. In controlling a group of motors, the system is extended by employing no-volt protection on the c.b. controlling the group. With installations of more than three motors, it is preferable to connect all star points together via each neutral o./l. element to provide a solid neutral point unaffected by unbalanced loads on the motor supply.

A recent demonstration we attended showed the starter to react efficiently against all kinds of faults. It was particularly effective against single phasing.

Flameproof Gate End Box

THE range of mining equipment made by W. AND H. NELSON LTD., Bellshill, Lanarkshire, has been extended by a new design of flameproof contactor operated gate end box. The unit has already been tested in operation, and is now in production. Buxton certificates have been issued for the equipment. Many of the latest N.C.B. specifications have been incorporated in the design.

Fitted in a case of fabricated mild steel construction with removable top cover and hinged front cover, it is mounted on channel type skids for easy transportation. Other features of the gate end box are—intrinsically safe remote control circuit; solenoid type overload relays with oil time lags; and a strongly constructed isolating switch.

A Versatile Cast Iron

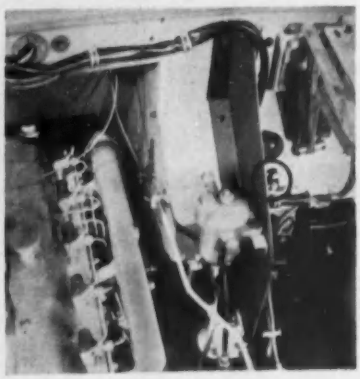
THE treatment of molten cast iron with magnesium leads to remarkable improvement in final physical characteristics as was shown by some demonstrations at the Engineering Centre Birmingham. Test pieces one-eighth of an inch thick can be bent or twisted; the metal is resistant to fracture and yet resists deformation almost as well as steel. It can be cast into intricate shapes and into all sizes and thicknesses and in many cases can be used where steel castings would normally be required. The new kind of cast iron can be heat treated and in that form can be used for spanners, hammers, and even aircraft gas turbine castings. The iron has proved itself to be better than steel for metallurgical rolls and offers an economical method of making hard-wearing gears for textile, paper making and similar machinery.

Known as S.G. Cast Iron, this versatile metal is the subject of patents in the name of the MOND NICKEL CO., LTD., and its manufacture is carried out under licence by numerous foundries all over the world.

Circuit-Breaker for Vehicles

PRODUCED by SALFORD ELECTRICAL INSTRUMENTS LTD., Magnet Hse, Kingsway, W.C.2, is a new "Klixon" circuit-breaker to take the place of the conventional fuse in vehicles. It is, however, not restricted to vehicles but can be used in any circumstances where low-voltage d.c. is employed. It uses as an operating element a "dished" metallic disc through which the current passes from one side to the other. The disc is mounted to a moulded phenolic base at its centre, and the contacts consist of two studs, mounted on the disc, and which normally make contact with two terminal studs. When the circuit loading exceeds the safe maximum operating limit, the bimetallic disc, actuated by the resistance heat snaps over, opening both contacts. After a short cooling period the disc closes and re-establishes the circuit. The unit is calibrated to carry 100% of nominal rating continuously and to trip at not more than 125% of nominal rating at an ambient temperature of 25° C. A typical "Klixon" C-912 circuit-breaker with a nominal capacity of 25 A will operate within 2 secs. with a current of 75 A or about 20 secs. with a current of 40 A.

Salford's miniature circuit-breaker for l.v., d.c. systems and, below, its installation in a vehicle



Transformer for Wood Glueing

A LOW voltage/high current transformer, for use with strip or wire heating of synthetic adhesives, is being produced by PHILIPS ELECTRICAL LTD., Oxford Hse, Oxford St, W.C.2. Metal strips incorporated in the jig, or copper wires embedded in the glue layer, are frequently used in the cabinet and furniture trades for cutting setting times on small assemblies to a matter of minutes.

Now made by Philips is this transformer for l.v. heating for wood glueing

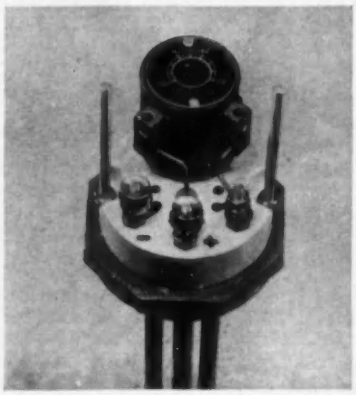
Working from a standard a.c. mains supply of 200-250 V, this transformer gives outputs of 200 A at 10 V, 135 A at 6 V or 90 A at 4·5 V. These voltages are low enough for the operator to work on the assembly in complete safety whilst the current is on. At the same time, using 26 s.w.g. mild steel strip as recommended, up to 20 ft of 2 in. wide strip can be heated at 10 V without overloading the transformer.

Energy Limiting Cartridge Fuses

A FURTHER development of the energy limiting feature of "Aeroflex" fuses made by PARMITER, HOPE AND SUGDEN LTD., Fluvent Electrical Works, Manchester 12, is now seen in a range of cartridge fuses known as the "Aeroflex" AD and FC types. In the new series, the pre-arcing energy is claimed to be further limited, with uniformity of performance throughout the range. Fully interchangeable with their previous types and with those of other manufacture, the AD and FC types are stated to have a breaking capacity of 46 kA (as against 33 kA in earlier types), whilst the fusing factor is to Class P standard (1·25) throughout the range. Despite ceramic fuses, and fixed end caps, fuses can be rewired by the makers.

B.N.E.'s New Low Price Immersion Heaters

THIS week, a new range of 3 kW embedded element immersion heaters has been announced by BRITISH NATIONAL ELECTRICS LTD., Charlton, S.E.7. The price of these heaters in 5 sizes from 11 in. upwards to 36 in. is £2. 14s. 8d. (purchase tax £1) with circulator tubes up to 30 in. costing 11s. and 36 in. models



The head of one of the new BNE heaters

13s. 6d. B.N.E. say that these low prices have been achieved without any sacrifice of the traditional quality and reliability associated with their products. Incidentally all B.N.E. heaters are made to take stem type thermostats which together with flanges are supplied at extra cost.

Prices of removable element types and also side entry outfits have, in addition, been reduced.

Prices for these are now as follows:

Removable single tube element types
24 in. 2 kW £4. 17s. (purchase tax £1. 15s. 7d.).
26 in. 2 kW (£5. 2s. (purchase tax £1. 17s. 5d.).
28 in. 2 kW £5. 6s. (purchase tax £1. 18s. 10d.).
30 in. 2 kW £5. 10s. (purchase tax £2. 0s. 4d.).
30 in. 3 kW (£5. 15s. (purchase tax £2.2s. 0d.).
Circulator tube 17s.

Side entry outfits
No. 19 2 kW (suitable for 13 in. minimum tank diameter), £4 (purchase tax £1. 9s. 4d.).
No. 20 3 kW (suitable for 17 in. minimum tank diameter) £4. 15s. (purchase tax £1. 14s. 10d.)
Prices include mechanical flange.
Circulator Jacket stand pipe £1. 10s.

Prices of New Fires and Heaters

THE prices of the two new fires—the "Ely" and the "Lincoln" recently announced by H.M.V. HOUSEHOLD APPLIANCES are as follows:

Model F.1 "Ely" £2. 16s. 9d. plus £1. 0s. 9d. tax: total £3. 17s. 6d.
Model F.3 "Lincoln" £6. 18s. 4d. plus £2. 10s. 8d. tax: total £9. 9s. 0d.

These new models, which are due for delivery early next Aug., join the popular Cavendish Room Heater (now going into increased production) to make a comprehensive and attractive range of efficient heating appliances bearing the H.M.V. trade name.

Prices are now available for the two new HURSEAL radiators which are to be on show at the Convention Exhibition.

Hurseal Junior Column Radiator

	£.	s.	d.
List Price	10	15	6
Purchase Tax	4	4	0
Total Retail Price	13	19	4

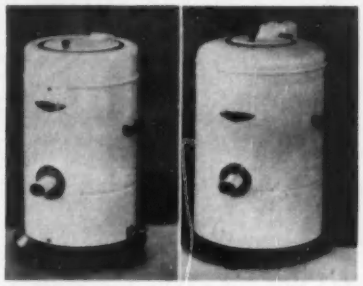
Hurseal TV¼ Panel Radiator

	£.	s.	d.
List Price	10	4	6
Purchase Tax	3	14	10
Total Retail Price	13	19	4

"Steel" Spin Dryers

TWO models of the "Steel" spin dryers now marketed in Great Britain by GILBERT J. MCCAUL AND CO., LTD., 142 Piccadilly, W.1, are the HZ4 domestic model and the HZ5 which is intended for boarding houses, schools and similar institutions.

The HZ4 retails at 32 guineas including purchase tax and holding 28 lb of wet laundry is powered by a 1/5 h.p. motor a.c./d.c. for 110, 200/230/240 V motor. The HZ5 complies with the relevant Factories Act in that it has an automatically locking lid and an automatically applied brake when the machine is switched off. It is driven by an a.c. motor of ¼ h.p. and handles 12 lb dry



Steel dryers are available in two models HZ4, and (right) HZ5

weight equivalent of completely wet laundry making it damp dry ready for ironing in five minutes. Price of this model including tax is 48 guineas.

Both machines are finished in cellulose enamel in white or cream as standard whilst pastel green or blue finishes are also available. Trimming is in chromium. The inner drums of the dryers are coppered steel as a protection against rusting and the effects of detergents.

New Simplex Weatherproof Fittings

BEING introduced at the Convention Exhibition next week by SIMPLEX ELECTRIC CO., LTD., Broadwell, Oldbury, Birmingham, are two new ranges of 60 W weatherproof screwglass lighting fittings.

Simplex have taken care to make their design in keeping with modern ideas and have produced these new fittings which will undoubtedly attract attention. Prices of the basic units are 10s. 6d. and 12s. The construction employed permits adaptability to a wide range of fitting combinations for surface mounting, for instance, the basic unit may be attached directly to the ceiling or to 2 in. centre conduit boxes. The side entry top attachment eliminates the need for unattractive swan-neck brackets. An attempt has been made in this new range to reduce the glare normally associated with well glass fittings. Two types of finish are available, either cast iron acid with resistant vitreous enamel or L.M.6 high corrosion resistant aluminium alloy.

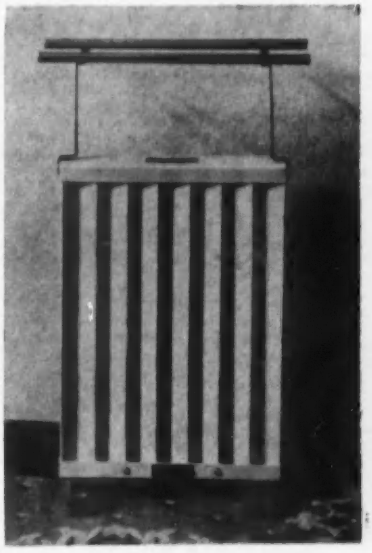
For the Electrical Trade

The Drydenair "Airo" Heater

NEW light-weight heater available in a standard (Type "S" 200-220° F) average surface temperature on low surface temperature (Type LS—130°/140° F) model is the "Airo" heater introduced by THOMAS DRYDEN AND SONS LTD., Grimshaw St, Preston, Lancs.

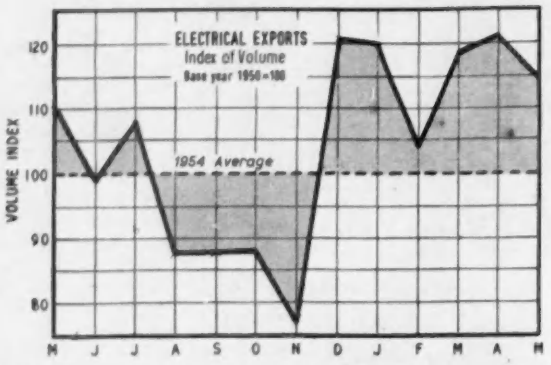
The Airo is available in a variety of sizes (Standard—500, 750, 1,000 and 1,500 W: LS—200, 500, 750 W loadings) and is finished in a choice of colours, cream, silver, light-green, brown, grey and white.

Important factors in its favour are its neat dimension 18 in. high by 2 in. wide with widths of 13½ in. or 27 in. so that it can be stood (on feet) or mounted on special wall brackets (these are alternative fixings) without obtruding into the room. As an extra a double towel rail easily fixed is available at 16s. 6d. or 1 guinea plus 3s. or 3s. 10d. tax. Prices of the Airo heater range from £3. 12s. 6d. plus £1. 6s. 6d. to £6. 5s. plus £2. 5s. 9d.



The Airo is neat and unobtrusive

EXPORTS and IMPORTS



Statistics for May

BY the end of last month, the strike in the docks appeared to have had little effect on the volume of electrical goods exported from this country. The volume during May, as shown by the ELECTRICAL TIMES index above, fell, but only slightly, since it is still well above the average for the last twelve months. In actual figures, the index now stands at 115, having dropped from the April level of 121. Last year, the May index was 106, all indices being based on 1950 as 100. It is interesting to note that last October's dock strike caused the index to fall to the extremely low level of 78.

In value, the electrical exports on which the index is based amounted to £15,942,385, although, it will be remembered, these exports comprise the machinery, goods and appliances shown in Class D, Division 16 of the official accounts. Although this category accounts for the bulk of electrical exports, it excludes domestic refrigerators and washing machines, whose May export value, when added to this total, gives the grand total of £17,150,105 shown below.

The slight reduction in exports was fairly evenly spread over the majority of the items listed in our accompanying table, the only exceptions, for which a small increase were recorded being signalling and bell equipment, instruments and meters, washing machines, refrigerators and accumulators. Among the cooking and heating apparatus, exports of electric cookers alone accounted for £97,078, and for toasters, £39,523, while for electric flat irons the figure was £100,707. Floor polishers contributed another £89,844 and food mixers, £43,779. In addition to the automatic power operated refrigerators, of up to 12 cu ft capacity listed in our table, exports of the automatic heat operated type amounted to £53,011 for the month. Australia took the greatest value of all the electrical equipment sent abroad in the period, with a total of £1,611,000, India following with £1,265,264, and South Africa £1,241,374.

Description	Exports Value (£)			Imports Value (£)	
	May 1953	May 1954	May 1955	May 1954	May 1955
Generating Sets:					
Diesel up to 200 kW	311,869	484,730	401,507		
„ over 200 kW	118,900	390,577	514,238		
i.c. driven	19,804	21,179	13,428		
Steam turbine-driven	—	46,258	15,700	9,293	15,275
with other prime movers	102,876	209,392	6,831		
Generators	366,225	252,463	186,430		
„ parts	625,303	430,500	598,580		
Motors	817,912	916,879	821,891	40,307	88,292
Motor starters and controllers	192,617	167,759	199,915		
Convertors and rectifiers	73,251	132,254	109,317	45,894	71,281
Transformers	815,319	1,038,359	928,007		
Switchgear and Switchboards	1,255,044	1,256,188	1,190,915		
Batteries, primary and parts	225,568	343,158	343,759		
Fluorescent and Discharge lamps	35,895	53,309	65,461		
Other lamps	114,875	116,201	137,999		
Radio and Electronic gear	1,860,083	2,482,581	2,507,794	663,706	1,340,960
Telephone and Telegraph Plant	1,319,314	1,362,143	1,354,891		
Cooking Appliances and parts	105,151	170,884	253,112		
Space heaters	15,964	30,333	35,768		
Water heaters	31,543	27,735	33,649		
Other heaters and parts	114,325	170,148	193,054		
Welding machinery	141,604	95,799	53,864	8,290	33,286
Signalling and Bell equipment	72,937	50,851	87,939		
Commercial Instruments	137,807	160,314	148,427	41,033	58,918
House Service Meters	126,965	133,573	139,420		
Electro-medical and X-ray apparatus	118,488	118,432	142,599	26,003	40,249
Fans	160,289	202,792	116,473		
Vacuum Cleaners	120,555	156,027	126,491		
Other Appliances and parts	238,098	351,522	334,545		
Portable power tools	161,674	166,156	189,781		
Washing Machines up to 150 lb	352,554	252,975	321,562		
Power Refrigerators, up to 12 cu ft	773,092	678,629	826,158		
Telephone and Telegraph Cables	771,424	332,397	561,048		
Paper-insulated Cables	904,934	492,973	473,708		
Rubber-insulated Cables	465,164	403,677	520,930	8,419	21,455
Winding and similar wires	160,944	93,379	114,559		
Other Cables and Wires	354,512	259,810	313,472		
Accumulators and parts	357,750	322,043	381,168		
Insulating Materials	207,081	121,173	161,487		
Electrical Ware	67,572	67,804	103,715		
All other articles	1,471,181	1,678,802	2,060,834	363,484	627,090
Total	15,556,299	16,241,858	17,150,105	1,212,399	2,296,806

NEWS OF THE WEEK

More Electrical Monopolies Inquiries

Minister names Batteries and Street Lighting

THE anticipated flood of questions on suggested references to the Monopolies Commission was put to the President of the Board of Trade last Thursday. In his reply Mr Thorneycroft named five subjects which he expected to place before the Commission very shortly, and these included another two subjects directly concerning the electrical industry, namely street lighting and electric batteries. In mentioning the individual references, the Minister again emphasised that in making them he in no way prejudged the question whether or not the arrangements involved operated contrary to public interest. Neither of the two references now named will cause much surprise. The report on the Commission's activities during 1954 mentioned that among suggestions and requests for enquiries received in that year were those concerning discriminatory arrangements in the battery field, and common or minimum prices in the street lighting industry. On street lighting also, representations have been made to the B.o.T. by local authorities, notably Wembley, in recent months. In addition, the Association of Municipal Corporations is compiling evidence of price fixing which although mainly concerned with building materials, also involves street lighting.

In the course of his Parliamentary reply, Mr Thorneycroft recalled that in July, 1952, when announcing the first reference under Section 15 of the Monopolies Act into practices prevailing in industry generally, he emphasised the importance of that type of investigation. He said he now proposed to send a further reference under Section 15 covering common prices and level tendering.

At the present time enquiries are being carried out by the Monopolies Commission into nine subjects including the supply and export of certain electrical and allied machinery and plant, and the supply of electronic valves and cathode ray tubes. At the time that the latter was submitted (last December) of a total of 21 references made, five of them affected the electrical industry, and if all the new items mentioned last Thursday are eventually investigated, the already high proportion will be increased to seven electrical subjects (including copper) of a total of 26 references.

John Thompson begin Dounreay Manufacture

HIGH rates of heat transfer will be required in "fast breeder" reactors of the type being built at the Dounreay nuclear power station of the Atomic Energy Authority. It is announced this week that John Thompson Ltd. have been entrusted with much of the necessary development, in collaboration with the A.E.A. The firm will be concerned with methods of fabrication for the liquid metal circuits, the design of complete steam and water equipment, the manufacture of the whole of the fusion-welded stainless steel vessels, liquid metal pipe lines, primary and secondary heat exchangers, boiler drums and of the associated plant, valves and instrumentation, together with the feed water treatment plant. A separate department has been set up to deal with this contract, and manufacture has commenced.

This work is quite separate from that which the company is carrying out in collaboration with A.E.I. Ltd. in the development of gas-cooled thermal reactor plant such as will be used in the first nuclear reactor stations.

Rural Scheme on Exmoor is Milestone in Development Projects

ONE of the most important rural electrification schemes to be inaugurated in the S.W. Electricity Board's area will be switched on tomorrow (24 June) in the Memorial Hall, Exford. The scheme will supply rural communities of Exford and Withypool, providing electricity to some 26 farms and 144 other rural premises, including cottages, schools, etc. It has involved the construction of about 15 miles of mains and the installation of 24 substations at a cost of over £27,000. More important perhaps, the scheme marks a special milestone in the Board's electrification plans. The Board is now tackling the really difficult and isolated parts. The project is also notable by reason of the enthusiastic support received from the communities involved—a feature often lacking in previous cases. Nearly 90% of those who could benefit from the supply, have agreed to connection at the outset. A special programme featuring the Exmoor scheme is being prepared by the B.B.C. and will be broadcast in the West of England Home Service on Monday at 6.30 p.m.

Anglo-U.S. Vacuum Cleaner Negotiations reported

REPORTS from New York over the weekend refer to negotiations going on now between the Lewyt Vacuum-Cleaner Corporation and a "major British electrical manufacturing company" with the object of making American vacuum cleaners under licence in this country. President of the Lewyt Corporation was in Britain a short time ago, and observed that he would be interested in expanding his manufacturing activities in S. Wales or Buckinghamshire. Negotiations are said to have reached a crucial stage, and consequently no name has been linked with Lewyt in the deal. Comments in London suggest that the British electrical firm involved is not one manufacturing the cleaners at present. Object of the deal is of course to enable the American concern to overcome some of our import controls.

I.E.E.'s "The Inquiring Mind" will stimulate Interest

SPECIFICALLY designed both in form and content to stimulate interest in technology among the youth of the country is the I.E.E.'s new documentary film "The Inquiring Mind." And it succeeds admirably in its task. By the whole-hearted co-operation of manufacturing, professional and educational bodies associated with the electricity industry, the film shows all facets of electrical engineering from research to generator installation and construction, and even has time to develop an historical background. The intent of the production is, as Mr Eccles pointed out at a Press preview, to imbue children at school with the scientific outlook, and to influence more boys to take up technology and thus swell the numbers of engineers and scientists in the coming generation. The rapid developments taking place in the use of nuclear power for peaceful purposes, the major railway electrification schemes and the development of computers, all based on electricity, would require electrical engineers in the future.

The film in black and white with sound track will be available in both 35 and 16 mm versions. It runs for thirty minutes and copies will be made available, on loan, to schools and other bona fide applicants who are interested in providing their boys with information on a professional engineering career. Particulars may be obtained from the Secretary of the I.E.E. at Savoy Place, W.C.2.

The Pedlars' Act

FOLLOWING the decision of Bradford City Court (reported last week) that vacuum cleaner salesmen canvassing from door to door, required a licence under the Pedlars Act of 1871, notice to state a case has been served on the clerk to the Bradford magistrates and the city's chief constable. No case has been stated previously on this point and the matter will be decided by the High Court. Chairman of the Bench gave a reserved decision and said they would state a case if the question of appeal arose.

County Councils won't support Assisted Wiring Plan

THE County Councils Association has refused to take any supporting or other role in the efforts of some bodies to achieve a scheme for assisted wiring. An invitation from the Standing Joint Committee of the 28 London Borough Councils to support a move for legislation dealing with faulty electrical wiring in residential accommodation, has been declined by the County Association's Parliamentary and General Purposes Committee. A report on the subject from the committee states that although they were in sympathy with the objects of the proposal, they could not recommend support. The matter, they said, appeared to have little connection with the statutory duties of county councils. The Standing Joint Committee are seeking the introduction of legislation enabling Electricity Boards to start assisted wiring schemes.

Scene during one of the cookery demonstrations given before an audience of 1,400 in Norwich a short while ago. Both afternoon and evening "performances" were given by Miss Marguerite Patten and were organised by the Eastern Electricity Board's Norfolk sub-area. A private demonstration was also put on for over 300 members of the Board's staff. Miss Patten made good use of various other types of appliances, especially the food-mixer, as well as the electric cooker. Automatic cooking was the theme of special displays in the hall

Heating Season Plans

PLANS for the 1955-56 heating season were laid and discussed at the recent four-days sales conference of Dimplex Ltd. Forty members of the senior staff were told by Mr E. J. Wade, managing director, of Dimplex's continued growth. The new factory at Millbrook is expected to be completed soon, and a large-scale sales promotion campaign is being planned. After the conference, the staff were guests of Mr and Mrs Wade at a dinner-dance at the Little Testwood Country Club.

Combustion Conference on July 6 and 7

TIMED to coincide with the Instrument Industries Exhibition is a short Conference on the "Instrumentation and Control of Combustion." This will take place on Wednesday and Thursday, July 6 and 7. Three addresses will be presented; on Wednesday morning Mr G. P. Clay (I.C.I.) will deal with "The Economic Level of Instrumentation in Boiler Plants," and in the afternoon Rear-Admiral Sir Sydney Frew will consider "Smoke Reduction and Fuel Efficiency by Measurement and Control." The Thursday morning address is on "Open Hearth Furnace Control" by Mr E. Whitehead. Conference fee is 10s. 6d. Application should be made to the Conference Secretary, 6 Duke St, St. James's, S.W.1. The sponsoring bodies are the Combustion Engineering Association and the British Industrial Measuring and Control Apparatus Manufacturers' Assoc.

Electric Clubs' Scholarships

THIS year's student scholarship awarded annually to a student at Birmingham College of Technology by the city's Electric Club, is to be given to Mr S. R. Kelly of Erdington. He hopes to use the scholarship to study hydro-electric generation on the Continent.

OFFICIAL PUBLICATIONS

U.K.–U.S.A. AGREEMENTS ON ATOMIC ENERGY for Civil Uses (price 6d.) and Defence Purposes (price 4d.) Available from H.M.S.O. (see page 1018).

PATENTS, DESIGNS AND TRADE MARKS. 72nd Report for year 1954. H.M.S.O. 1s. 3d.

TUMMEL-GARRY PROJECT. N. of Scotland H.E. Board Constructional Scheme 2A. Confirmation Order (S.I. 813) and Explanatory Memo. H.M.S.O. 2d. each. (See page 1047.)

BREADALBANE PROJECT. N. of Scotland Board's Constructional Scheme 25A. Confirmation Order (SI825), and Explanatory Memo. H.M.S.O. 2d. each (see page 1047).

GISLA (LEWIS) PROJECT. N. of Scotland Board's Constructional Scheme 34. Confirmation Order (SI840), and Explanatory Memo. H.M.S.O. 2d. and 3d. resp. (see page 1047).

RESTRICTIVE BUSINESS PRACTICES AND PUBLIC INTEREST. F.B.I. statement (see page 1011). Available from Federation, 21 Tothill St, S.W.1, 1s. 3d.

BRITISH STANDARD. B.S. 1928, 1955: Gramophone Records, Transcription Disc Recordings and Disc Reproducing Equipment.

Permali expand in U.S. and Britain

PLANS have now been finalised by Permali Ltd. for the establishment of their own factory in America. It is to be built at Mount Pleasant, about 30 miles from Pittsburgh, and production is expected to start by the end of this year. The company's U.S. subsidiary, Permali Inc., is at 55 West 42nd St, New York. Reason for the new move is increased demand.

The same company also state that following negotiations with Jablo Plastic Industries Ltd., they have registered two new subsidiary companies. They are Hydulignum-Jabroc (Tools) Ltd., and Jabroc Ltd., both of whom have their works in Mill Lane, Waddon, Surrey.

Mr Leslie Gamage, vice-chairman and joint managing director of G.E.C., newly elected President of the Electrical Industries Club, speaking at the Club's monthly luncheon last week. With him are (left to right) Messrs Frank Phillips, E. G. Batt, and A. B. Wildsmith

NEW INDIAN H.Q.

A NEW Indian head office has been established in Calcutta by Simon-Carves Ltd. The company has maintained a resident engineering staff in India for some 40 years to cope with the tremendous amount of business they carry out in that country. The new headquarters will be at Standard Buildings, 32 Dalhousie Sq, and will be in the charge of Mr N. A. Ross. The firm's existing office at Jamshedpur will be continued as a site office.

The First Half-Century

The Automobile Club has now issued the regulations under which trials of light delivery vans will be held from 20 Sept. to 24 Oct. The trials will include thirty days of running, the daily mileage depending on the class of vehicle, and varying from 60 to 80 miles. Each vehicle will be required to carry loads provided by the club, and at times to run without load; and any number of stops may be required during the runs so as to approximate as far as possible to service conditions. Bodies are to be approved by the club. In the case of electrical vehicles, the energy will be recorded, and also the time taken in changing batteries, but no account will be taken of the time required for charging. If two sets of batteries are used, the declared price of the vehicle is to include both sets.—*From our issue of the 22 June, 1905.*

Modern Lighting for Large New Offices

THE new modern offices in Southampton occupied by Shell Mex and B.P. Ltd., have been tastefully furnished and decorated, and the illuminating engineer was only faced with the one problem of providing lighting which blended with light decoration and general interior atmosphere. Choice of fittings for these up-to-date offices fell on the Cambridge and Canterbury twin lamp fittings made by Philips Electrical Ltd. Both consist of a basic steel channel and "Perspex" diffuser. About a 100 of these fittings were installed.

Current display of control gear made by Brook Motors Ltd., to be seen in the company's London branch office at Palmer St, Westminster

Conditions at Clarence Dock Power Station criticised

A NATIONAL inquiry into conditions in British power stations was called for at last week's triennial conference of the National Union of Enginemen, Firemen, Mechanics and Electrical Workers. Complaints were made about working conditions at Liverpool's Clarence Dock power station. Pulverised fuel dust in the stations was said to be the possible cause of fires, bronchitis and dermatitis. The Liverpool branch's resolution asking that the C.E.A. be urged to institute an inquiry into the amount of dust and dirt prevalent in power stations and particularly in pulverised fuel-fired stations was carried. The resolution also requested an inquiry into the operation of defective plant.

The conference was told that dust and dirt at Clarence Dock had been the source of concern to employees there for many years, and in spite of representations the position had deteriorated. It was alleged that nothing had been done to implement any of the recommendations made by an investigating sub-committee in 1953. Meanwhile the high incidence of pure pulverised fuel dust had been the cause of several large fires.

350,000 h.p. Plant Order

THE G.E.C. have received an order for air compressor plant of 350,000 h.p. from the Ministry of Works. Equipment is for extensive new Government research and testing facilities, comprising centrifugal compressors with turbine and synchronous motor drive.

Striking a Lighting Balance in a Big Store

A COMBINATION of fluorescent and tungsten light sources was employed at the Southend department store of Keddie and Sons Ltd., to obtain a suitable balance between general and "emphasis" lighting—the familiar illumination problem where large stores are concerned. Fluorescent fittings were utilised for the general illumination and 75 W and 150 W reflector spotlights in either swivel mounted holders or in Eyeball fittings recessed in the ceiling, for particular displays. All fittings were supplied by the British Thomson - Houston Co., Ltd. Fluorescent fittings include the Monolux 5 ft model and the recently introduced F1235 decorative fitting having a shaped opal "Perspex" diffuser and incorporating a dustproof egg-crate louvre. The Monolux are ceiling mounted and the existing beams provide cut-off. The F1235 fittings are suspended by conduit. Contractors were Rayford Electrical.

Philips' Cambridge and Canterbury fittings used (left) in modern Southampton offices, and (right) Monolux and F1235 fittings with spotlights supplied by B.T.H. for a Southend departmental store

Resignation from E.L.F.A.

RESIGNATION of the Engineering and Lighting Equipment Co. from the Electric Light Fittings Association is referred to in the company's report for 1954-55, to be submitted at the annual meeting next month. The Earl of Verulam, chairman, explains that the firm's position in an association like E.L.F.A. is not the same as that of some of the larger members who make lamps and other components as well as fittings. In addition, he states, recent Monopolies Commission recommendations in respect of other sections of the industry have led to the belief that radical changes in the structure of the industry and in the methods of competitive tendering, are inevitable.

NEWS IN BRIEF

American Soc. of Tool Engineers are to hold their eleventh biennial Exposition at the International Amphitheatre, Chicago, between 19 and 23 Mar. next year.

"Better Ways, 19 Paths to Higher Productivity," is the title of a handbook being published by the British Productivity Council setting out the techniques of management in concise form. Price is 2s. 6d.

Latest addition to the Midlands Board's transport fleet is a light-weight general-purpose lorry made entirely of aluminium plate, sheet, and extruded section. Mounted on an Austin 2/3 ton chassis and weighing about 9 cwts, it was developed by the Board's transport department in conjunction with Northern Aluminium Co., Ltd.

Development of industrial design in Great Britain is described in a booklet prepared by the Council of Industrial Design for Sweden's international exhibition of architecture, home furnishings and craft. The booklet is in Swedish and English and also includes a catalogue of the British exhibit. The exhibition was opened on 10 June at Halsingborg.

London and provincial managers of Sloan Electrical Co., Ltd., met in London for their annual conference recently. Successful innovation was the formation of study groups dealing with various aspects of trading. Findings were subsequently submitted to the conference for final discussion.

A broadcasting company to serve some 6½ million people in Africa is the main recommendation of a Commission which has been investigating the future of radio in the Rhodesias and Nyasaland.

Course on "The Use of Radio-Isotopes in Engineering," arranged by the A.E.R.E. at Harwell, and the British Council, ends tomorrow. For two weeks 14 specialists from seven countries attended lectures and demonstrations and visited various establishments.

Ransome and Marles head office and works fire brigade won the Private Fire Brigades Championship of All England on 11 June.

South Wales Demonstration of Stage Lighting

THE series of conferences and demonstrations arranged by the S. Wales Electricity Board in Cardiff last week proved most successful, and drew capacity audiences. The system of stage and coloured lighting, with electronic control for dimming and colour changing was by Thorn Electrical Industries, and the local store, James Howell and Co., provided added interest with a fashion show. In the past 12 months the Board have held similar conferences on Power Factor Correction and Electronics in Industry.

The Board's senior assistant chief commercial officer, Mr A. J. Dalton, spoke on Rivalling the Rainbow, explaining how the most complicated control system had been simplified by using electronic equipment. He went on to demonstrate the control panel, which will be used by the Board during their cookery and other demonstrations. Later the control was taken over by Thorn's theatre lighting engineer, Mr C. Passmore.

One of the fashions shown during the S. Wales Board's demonstration of stage and auditorium lighting at Cardiff last week

QUESTIONS IN PARLIAMENT

Ministerial Responsibility

TRANSFER of responsibilities relating to the iron and steel and non-ferrous metals industries and the engineering industry from the Ministry of Supply to the Board of Trade were announced in the Commons last week by Sir Anthony Eden. Main purpose of the reorganisation was to relieve the M.o.S. of duties not associated with the armed forces and to associate the B.o.T. more closely with the major industries contributing so greatly to our export efforts. The change is expected in about a month's time. Staff now dealing with the relevant industries will be transferred from one Ministry to the other, and the M.o.S. will continue to be responsible for the aircraft and light metal industries. Further consideration is to be given to the electronics industry, he said.

Rating and Valuation

IN the course of the second reading of the Rating and Valuation (Miscellaneous Provisions) Bill, Mr G. Nabarro again raised the question of lump contributions made by the C.E.A. in respect of power stations and other premises not subject to local rating. He alleged that local authorities with large power stations in their districts were being harshly treated and severely mulcted of revenue. Citing the case of Stourport he said since vesting day the local authority had lost about £645,000 from the power station. In present circumstances they will receive a total of £80,000 in the ten years to 1958, and will benefit no more from the addition of the second station. A similar situation existed with regard to the Board's numerous showrooms, and he asked that private and public enterprise should receive the same rating treatment. It would not be difficult for the Inland Revenue to value power stations for rating. Mr W. F. Deedes, replying, said the pool arrangements of the C.E.A. would be the subject of review. Earlier Mr F. Harris deprecated the fact that nothing was being done about the difficulties of small traders. He pointed out that they would be severely hit, and urged some action now instead of leaving it to be rectified later.

Credit Terms and H.P.

DOUBT as to the usefulness of last February's reimposition of restrictions on credit trading facilities and hire purchase was implied by Mr J. Harrison, when he asked what results the action had achieved. Mr D. Kaberry replied that the amount of credit extended to consumers had been restrained, but actual figures were not available. Asked for an example of how the restrictions had affected the balance of payments position, Mr. Kaberry said it might help to know that discussions were taking place on collecting statistics on hire purchase. It was hoped to start collection and publication shortly.

Monopolies

SPIRITED questions on the limitation of the power of monopolies were warded off by Mr D. Kaberry last week. Despite pointed questions he referred members to the debate on the Address and reminded them of the impending report dealing with certain restrictive practices and trade courts.

Profit Sharing

A NUMBER of electrical concerns have been operating profit-sharing schemes for many years, and this policy of industrial co-partnership is now being advocated by the Government. Mr A. Woodburn asked last week what action the Govern-

ment proposed to take in the matter. The Prime Minister said it was essentially a matter for industry, but the opportunity would be taken in the future to give indications as to how the Government would help.

Bank Advances to Public Industry

NO guidance had been given to the banks about advances to nationalised industries, Sir Edward Boyle told Mr J. Grimond last week. He said it was not the practice to issue such directives. The banks were aware of the essential nature of the services provided by the nationalised industries, but at the same time, they were also aware of the desirability of avoiding an undue expansion of advances generally. Mr P. Noel-Baker commented on the confidence in the efficiency of the nationalised industries shown by the Government's proposals for investment programmes of £2,000m for electricity and £1,200m for the railways.

Railway Electrification

ASKED for a progress report on plans to electrify the railway line between Fenchurch St, Tilbury and Southend, Mr J. Boyd-Carpenter said he had been told by the Transport Commission that progress had been made in the planning and surveying necessary for major engineering works prior to actual electrification work. He added that it was hoped to make a start with the new "fly over" junctions at Barking and rearrangement of track layout next spring.

Flashing Lights on Roads

A NUMBER of questions were asked last week on the desirability of having so many flashing lights either on vehicles or on or near the roads themselves. The Minister of Transport replied that the advantages of flashing lights on pedestrian crossings far outweighed any inconveniences. As regards vehicles a report from the Road Research Laboratory was awaited. Later, the Minister explained that flashing indicators were fitted originally to cars destined for overseas markets.

Welsh Bill

THE N. Wales Hydro Electric Power Bill was formally read a third time and passed by the House of Lords last week.

Sayings OF THE WEEK

"It would seem, therefore, that we need a new breed of executive, who is something of a mathematician, a scientist, and production engineer, in addition to possessing some business knowledge particular to the individual concern. . . ." D. W. HOOPER, at the Institution of Production Engineers' conference.

"A man brings more to a factory than the work of his hands. He brings a part of his life, and he should be able to enjoy rights and satisfactions in that working life just as he does in his life as a citizen. . . ." SIR WALTER MONCKTON, at the I.L.O. conference.

ELECTRIC SUPPLY NEWS

Castle Donington

Preparatory to the commissioning of the first 100 MW set at Castle Donington (expected later this year), the first section of the 132 kV grid substation there has been energised by means of a new 5½-mile long o.h. line looping into one of the existing Nottingham / Coventry feeders, to enable a works supply to be given. Castle Donington substation is of the low double bus type and divided into three sections, the reserve bars being in the form of "horse shoes," with circuits back to back. Although this type of layout reduces the overall length of a normal double busbar station by approximately 50%, the length of this station is still 800 ft. The substation will have 20 oil c.b.'s, controlling three 100 MW generators, two 275/132 kV, 120 MVA auto-transformers, two banks of two 132/3·3 kV, 10 MVA station transformers, three bus-couplers, two bus-sections, six feeders and a reactor. There are skeleton bays for a further ten circuits. To avoid the reserve bars of the centre section having to cross the main busbar with overhead connections, a short length of 132 kV 0·6 sq in. cable, two circuits per phase, has been incorporated in the bars. The first and third sections of the bars are coupled by means of a 90 MVA reactor which has been installed to limit the fault level to the rupturing capacity of the 3,500 MVA bulk oil circuit-breakers which are of B.T.H. manufacture. These c.b.'s are pneumatically closed and spring opened.

Glamorgan

During a 3-day public inquiry at Barry into the application of the C.E.A. for a compulsory purchasing order for 250 acres of land on which to erect a power station at Aberthawe on the estuary of the River Thaw in the Vale of Glamorgan, Mr. H. J. Bennett, controller of the South Wales Division, emphasised that it was more desirable to have surplus electricity for export from a coal producing area than to import it as was being done now, sometimes at the rate of 100 MW a day. Questioned about an alternative site at Margam, he said the cost of providing an intake of sea cooling water would be £1,629,000 more than at Aberthawe, while an additional 50 to 70 ft of ground piling would be necessary. It was his conviction that the Aberthawe station was necessary, even though by 1965 there would be a surplus capacity in South Wales. Earlier, Mr G. Thesiger, Q.C., for the Authority, had explained that in all 307 acres of land would be involved, one-third of which was occupied by a golf club, one-third was mainly grazing land, and the remainder, saltings and foreshore which the public would not be prevented from using. Grit collectors and electrostatic precipitators would be installed, the estuary of the River Thaw re-aligned and ash deposited in the old course. Mr Donald Clarke, an executive of the Authority, also pointed out that lack of deep water and rock foundations and increased costs were against the Margam site even though it was on the doorstep of the principal electricity load. Mr T. V. Walters, deputy clerk, Glamorgan C.C., said his council, in principle, did not object to the proposals. Mr C. Hounter, deputy town clerk of Barry, added that having been assured that all practicable measures would be taken to avoid dust emission, and that there would be no tidal flow of ash deposit to interfere with the amenities at Barry's beaches, his council offered no objection. Cardiff Rural Council had also withdrawn their earlier objections, feeling that any damage to amenities was outweighed by the benefit to the people of South Wales by the introduction of more power.

High Marnham

A contract for a further two 200 MW steam turbo-alternators for the new High Marnham power station, on the River Trent, has been placed with the English Electric Co., Ltd., by the C.E.A. Three such sets have thus been ordered—five are planned for installation.

North of Scotland

Three schemes of the North of Scotland Hydro-Electric Board were last week confirmed by the Secretary of State for Scotland. Under one, amendments to the Board's Breadalbane scheme, Perthshire, will increase the scheme's output by 9 million units annually to 313 millions. In the second, amendments to the Tummel-Garry project will add 1½ million units to the estimated production of 300 million units annually. The third, the Gisla project, will supply 2 million units to the distribution system in Lewis.

Stroud

A new 132 kV grid substation, planned to meet the demand in the Midlands Electricity Board's Stroud district was inaugurated last week by Mr W. S. Lewis, at Ryeford, near Stroud.

LIGHTING SCHEMES

Birmingham. The Public Works Committee plan to replace the existing 24,350 gas street lamps by electricity, at an estimated cost of £1,300,000 spread over 13 years.

Leeds. The Street Lighting Committee wishes to spend nearly £60,000 during the coming year on improved lighting along several main roads.

Pontypool. The council has approved a scheme for sodium lighting from the Turnpike to Clarence Corner, to cost £3,080.

COMPANY ACTIVITIES

THE demise of E.P.L. has been of considerable assistance to Richardsons Westgarth and Co. It has been progressively successful in recent years, but like many others encountered severe Continental competition in 1954. Result was a halt to the upward trend in trading profits at around the £1m mark. But with no E.P.L. to meet, the bill for taxation dropped from £650,300 to £558,000, leaving the net balance available £83,300 higher at £446,300. Assuming the company's experience to be common with others, the worst of the competitive period should now be over. This may explain the board's decision to raise the dividend from 15% to 16¼%. This is covered over two-and-a-half times, and the 5s. shares at 16s. 6d. gives the attractive yield of 5¼%.

Aron Electricity Meters are another taxation beneficiary. Profits before tax for the year to 31 Mar. last was £119,800 compared with £165,700 for the previous year. Taxation was more than halved at £53,500 in this instance, too, leaving the net figure higher, at £66,304 against £52,765. Evidence of past conservative finance is to be seen in the return to the accounts of £8,847 no longer required for tax, and the crediting to separate capital reserve of £32,399, the proceeds of the sale of investments previously written off. Out of earnings of nearly 76%, dividend is again 15%. At 60s. the shares yield 5%.

Too many shareholders fail to take up attractive new share issues in their own companies. There are many "rights" and "bonus" issues these days, and many shareholders can't afford, they think, to take up all the "rights" offers that come their way. Never forget, however, that both "bonus" and "rights" issues can be sold in the market, usually at a profit. Recipients merely have to sign the appropriate forms sent them, and then pass them on to their banker or stockbroker for sale. A case in point is Ultra Electric (Holdings) which recently made a combined issue of new shares to shareholders at 12s. 6d. for the "rights" and also some free shares. Both can be sold at 17s. 6d. each. On the other hand, the "rights" are well worth applying for.

The storage battery business outlook seems "set fair." For the car industry that is understandable with the big development programmes under way. Mr A. W. Browne, at the annual meeting of the Chloride Electrical Storage Co. referred to an ever expanding demand in other directions too. There is, he indicated, an outlet of growing importance in the provision of batteries for the propulsion of road vehicles and factory trucks. There are also many special uses for batteries which make together a considerable additional market. In such circumstances Mr Browne must view the company's cash position with some satisfaction, as at the end of last year he had available some £3m in cash and other liquid assets as against known capital commitments of £582,000.—*From our City Correspondent.*

Aron Electricity Meter Ltd.

For the year to 31 Mar. last the profit is £119,803 (*£165,722*), but after the reduced taxation charge the balance is £66,304 (*£52,765*). The dividend is again 15%.

Broadcast Relay Service Ltd.

The group trading profit for the year ended 31 Mar. last rose to £2,928,480, compared with £2,431,064 for the previous year. After charging taxation, etc., the net balance is £612,331 (*£546,184*). That figure is struck after providing £1,200,000 (*£800,000*) for general contingencies reserve. The final dividend of 12½% tax free, makes the total 22½% (*22%*).

E. K. Cole Ltd.

After providing for depreciation and taxation, the net profit for the year to 31 Mar. last amounts to £304,779, compared with £181,332 for the previous period. A final dividend of 10% makes a total of 17½% on increased capital.

Ferranti Ltd.

For the year ended 31 Mar. last the group profit of the company and three subsidiaries amounts to £576,605. This compares with £546,863 for the firm and two subsidiaries for the nine months previously. Both figures are after charging taxation, and the 1954-55 total also takes into account the net loss of £143,433 incurred by the subsidiaries. The dividend is again 6%.

Greengate and Irwell Rubber Co. Ltd.

Net profit for the fifteen months ended 31 Mar. last is £544,843, compared with £366,137 for the previous year. A final dividend of 25% makes the total 37½% (*20%*). It is proposed to make, subject to C.I.C. consent, a 100% scrip issue to Ordinary stockholders.

Keith Blackman and Co.

Profit, before taxation, for the year to 31 Mar. last is £262,347 (*£276,866*). The dividend is increased by 2½% to *15%*.

Kenya Power Co. Ltd.

A debenture issue is to be made shortly in Britain and Kenya by this concern to meet the cost of erecting the 132 kV transmission line the distance of 253 miles from Uganda, from whence a bulk supply will be obtained. Estimated cost of the line is £3,800,000. It is stated that work on the project is to start in the next few weeks and is expected to be completed in 2½ years.

Lightfoot Refrigeration Ltd.

Trading profit for 1954 is £54,374 (*£50,270*) which includes £11,300 in respect of previous years. A final dividend of 3% again makes the total 6%.

Richardsons, Westgarth and Co. Ltd.

Although the gross profit, after depreciation for the year ended 31 Mar., at £1,004,304 is only about £9,000 lower than a year earlier, with a smaller taxation charge the net profit amounts to £446,339, compared with £363,022 for the previous period. The dividend is raised by 1½% to 16½%.

Ruston and Hornsby Ltd.

Group profit for the year ended 31 Mar. last, is £2,776,794, against £2,820,730 a year ago, and after charging depreciation and taxation the net profit is £1,060,753 (*£1,062,703*). The dividend is again 12½%.

Scottish Cables Ltd.

Volume of production achieved last year was a record for the company, but severe competition both at home and abroad, resulting in lowering of profit margins, was reflected in a slightly reduced trading profit. Additional factory space is already being utilised and new plastic extruding machines have been installed. Delivery has also been received of an American continuous extruding plant to facilitate the production of rubber insulated cable on an efficient and economic basis, Mr William Fraser, the chairman, states. It has been decided to market a range of p.i.l.c. cables with aluminium conductors, as an alternative to copper.

Year to 30 Apr.	£ Trading Profit	£ Net Profit	% on Ord. Earned	% on Ord. Paid	Ord. Price High	Ord. Price Low
1951	274,561	106,205	75	30	27/6	18/9
1952	327,198	122,603	75	32	11/9	9/–
1953	495,423	170,224	51	20†	13/3	11/1
*1954	391,239	149,399	44	27½	22/4	12/11
*1955	388,217	167,181	48	27½	22/6	19/4

*Year to 31 March. †Plus 100% capital bonus.

E. and H. P. Smith Ltd.

Profit, before taxation, for the year to 31 Mar. last is £27,473 (*£14,207*) and the dividend is again 12½%.

Venner Ltd.

Turnover and profit last year were the highest in the history of the company, Mr A. A. Rowse, the chairman, states. Sales increases were recorded in all departments. Export sales were, in the main, confined to the Time Switch and Instrument Division and amounted to 25% of the output. During the year it became increasingly apparent that in order to sustain the high level of output, and in particular, to finance the volume of debtors consequent on expanding foreign trade, it was essential to have additional cash resources. An unsecured loan of £200,000 at 5½% redeemable between 1962 and 1967 was arranged.

Dividends Declared

Aiton and Co. Ltd. Final dividend 12½% making 20% (*17½%*).

Burco Dean Ltd. Interim of 7½%.

J. and E. Hall Ltd. Interim 2½% (*same*) but on increased capital.

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Six Point THERMOSTAT

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COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

24 June—Romford T.C. Class A and B lanterns, lamps, on concrete and steel columns for street lighting improvements. —See 16 June issue.

27 June—Halifax T.C. Electric passenger lift at George St shops and offices.—See 16 June issue.

27 June—Luton T.C. Installation in canteens at High School and Beechwood school.—See 16 June issue.

27 June—Morecambe and Heysham T.C. Installation in 37 houses and 28 flats on Branksome Drive estate.—Advertised in 16 June issue.

27 June—West Riding. Improvements to lighting at Birkenshaw C. of E. school. —See 16 June issue.

27 June—West Riding. Rewiring at Carlinghow primary school.—See 16 June issue.

28 June—Goole T.C. 300 kVA diesel alternator and duplicate busbar switchgear.—See 19 May issue.

29 June—Crosby T.C. Erection of steel columns and supply and fixing of brackets, lanterns, sodium lamps, etc. —See 16 June issue.

29 June—Lisburn (Antrim). Installation in intermediate school at Forthill.—See 2 June issue.

29 June—Newcastle-on-Tyne T.C. Installation at former Princess Mary Hospital. —See 16 June issue.

30 June—Farrington (Lancs) P.C. Street lighting installation in parish.—See 26 May issue.

30 June—Lancashire. Light fittings and replacement glassware to county establishments.—Advertised in 16 June issue.

30 June—Loddon (Norf) R.D.C. Electrical installation in 10 houses at Langley and 8 at Hellington. Housing Officer, Council Offices.

1 July—Kirkcaldy T.C. Installation at Old Folks' Home in Dunnikier Rd.—See 9 June issue.

1 July—Macclesfield T.C. Sodium lighting on concrete columns along Hurdsfield Rd, Cumberland and King Edward Sts.—Advertised in 9 June issue.

1 July—Maidstone T.C. Electrical installation in 88 houses on Shepway estate. Borough Surveyor, Palace Ave.

1 July—Norwich T.C. Rewiring of Bridewell Museum, City Engineer's Office, City Hall.

2 July—Bradford T.C. Lighting, heating at Conditioning Hse.—See 16 June issue.

2 July—Stockport T.C. Improvement to classroom lighting at Greek St high school for girls. Director of Education, Town Hall.

4 July—Manchester T.C. Electrical heating installation for play shed at Crumpsall open air school. City Architect, P.O. Box 488, Town Hall.—Advertised in this issue.

4 July—Manchester T.C. Electrical installation in 49 flats in Floats Hall Rd, 58 in Greenbrow Rd, and 43 in Colshaw Rd, at Wythenshaw. Director of Housing, Town Hall.—Advertised in this issue.

4 July—Stranraer T.C. Electrical fittings in old people's houses and clubs. Moffatt and Wright, quantity surveyors, 51 Sandgate, Ayr.

5 July—Co. Antrim. Electrical installation in new intermediate school in Warren Gardens, Lisburn. J. M'Candless, consulting engineer, 6 Murray St, Belfast. Deposit £3. 3s.

5 July—Bedlington (Northumb) U.D.C. Vertical spindle unchokeable centrifugal pumps, driven by electric motors.—See 2 June issue.

5 July—Swansea T.C. Lighting installation at central garage and workshops at Pipe Hse Wharf.—See 16 June issue.

6 July—Bingley U.D.C. Concrete columns, lanterns, auxiliary gear, etc., for street lighting in Cottingley Moor Rd.—See 9 June issue.

6 July—Birmingham T.C. Lighting and power installation at aged persons' home in Alvechurch Rd, West Heath. Sir Herbert J. Manzoni, City Engineer and Surveyor, Civic Centre. Deposit £2. 2s.

6 July—Clutton (Bristol) R.D.C. Electrical installation in 20 houses at High Littleton. J. Barwick, clerk of council, Council Offices, Temple Cloud, near Bristol. Deposit £2. 2s.

6 July—Coleraine (N.I.). Electrical installation, including stage lighting in new parochial Hall, Kilrea. R. B. Thompson, consulting engineer, 1 Waterside. Deposit £5. 5s.

6 July—Derby T.C. Installation in 84 houses and bungalows in Harvey Rd. —See 16 June issue.

7 July—Co. Down. Electrical installation in Downpatrick new technical and intermediate school. J. M'Candless, 6 Murray St, Belfast, consulting engineer. Deposit £3. 3s.

7 July—Galway. Electrical installation in nurses home at Monaghan mental hospital. E. R. Ryan, consulting engineer, 1 Montpellier Terr. Deposit £10. 10s.

8 July—Herefordshire. Supply of electrical goods to Welfare Depot. County Welfare Officer, 17 St. Owens St, Hereford.

8 July—Westmeath (Eire). Two electrically operated low lift pumping units for Kinnegad sewerage scheme.—See 16 June issue.

9 July—Co. Louth. Pumping and water filtration plant in supply system for villages of Louth, Mullacrew and Tallanstown.—See 12 May issue.

11 July—Co. Dublin. Supply of electrically driven booster unit at Swords. Sanitary Services Dept., 6 Parnell Sq.

11 July—Hebburn U.D.C. Electrical installation in 120 houses in Monkton Lane. Engineer and Surveyor, Council Offices, Argyle St. Deposit £3. 3s.

11 July—Keighley T.C. Electrical installation in Eastwood secondary modern school. E. G. Felgate, Borough Architect, College St. Deposit £1.

11 July—Manchester T.C. Installation at King St Central Highway Depot, Ardwick.—Advertised in 16 June issue.

11 July—Stepney B.C. Lighting and power points in 30 dwellings and an electric passenger lift, for Lance St housing scheme. Borough Engineer and Surveyor, Municipal Offices, 227-33 Commercial Rd, E.1. Deposit £5. 5s. in respect of first item.—Advertised in this issue.

12 July—Aireborough U.D.C. Supply and installation of class B mercury vapour street lighting in Over Lane, Town St, and Layton Rd, Rawdon. Engineer and Surveyor, Council Offices, Micklefield Hse, Rawdon. Deposit £2. 2s.—Advertised in this issue.

13 July—Newcastle-on-Tyne T.C. Installation in 852 flats on Longbenton estate.—See 16 June issue.

14 July—Blackburn T.C. Supply of materials for conversion of side street lighting from gas to electricity, including concrete columns, lanterns, swan-neck brackets, etc. Borough Engineer, Town Hall.—Advertised in this issue.

20 July—Newcastle-on-Tyne T.C. Installation in 1,015 houses on St. Anthony's estate.—See 16 June issue.

No date stated.—N. of Scotland H.E. Board. Supply and construction of 132 kV double-circuit steel tower transmission line between Nairn and Keith. Merz and McLellan, engineers, 72a George St, Edinburgh. Deposit £2. 2s.—Advertised in this issue.

No date stated—N. of Scotland H.E. Board. Lighting and heating installation at Kilmelfort power station. Strain and Robertson, 5 Park Circus, Glasgow. Deposit £2. 2s.—Advertised in this issue.

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources including an index of trade information with over 100,000 entries

A Selection from the 98 queries answered this week

"Magimix" mixers, address for? S.P.—Keith Lowe (Engineers), King St, Dudley, Worcs.

"Turnover" toaster, address for? S.E.B. —Kenwood Electrics Ltd., Hipley St, Old Woking, Surrey.

"Secundalux" emergency lighting, makers of? W.C.—Secundalux Ltd., 18 Halton Lane, Wendover, Bucks.

"Ergon" sun ray equipment, makers of? E.E.B.—Ergon Electrical Mfg. Co., Ltd., Vencourt Place, W.6.

"Rellim" fans, makers of? S.E.—British Rellim Products, 21 Euston Sq, N.W.1.

Infra-red grillers, suppliers of? T.E.—M.E.A.C. Ltd., 21 Newman St, W.1; A. E. Warner (London) Ltd., 56 Brewer St, W.1; Apsley Metal Products Ltd., 12 Shirland Mews, W.9; Brattel Electric Co., Ltd., Dorchester-on-Thames, Oxford; "V" (Development and Trdg.) Ltd., 22 Clifton Rd, W.9.

"Lassothene" tape, makers of? D.E.—Herts Pharmaceuticals Ltd., Bessemer Rd, Welwyn Garden City, Herts.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon House, Theobalds Rd, W.C.1, quoting reference.*

6 July—Iraq. Supply and erection of a switchboard for distribution of d.c. supply at Halapcha. Tender No. 117. Directorate General of Municipalities, Baghdad. B.o.T. (Ref.: ESB 11241/55).*

8 July—S. Rhodesia. Supply of total of 28,000 230 V bayonet type pearl electric light bulbs, between 25 W and 100 W. Tender No. 2154, Secretary, Tender Board, P.O. Box 8075, Causeway. B.o.T. (Ref.: ESB 12821/55).*

13 July—South Africa. Stores Dept. of S. African Railways, Johannesburg, require one 300 kVA, 3-phase, 11 kV/400 V transformer, and two 10 kVA, single-phase, 6·6 kV/110V single transformers. Tender No. C.111. B.o.T. (Ref.: ESB 12594/55).*

14 July—South Africa. Supply of 20,000 yd of P.V.C. switchboard cable, insulated and sheathed, 61-wire. Union Tender and Supplies Board, 291 Bosman St, Pretoria. B.o.T. (Ref.: ESB 12672/55).*

20 July—Australia. Manufacture, erection, etc., of two 5,000 kW turbo alternators with condensing and feed heating plants, for Mount Gambier power station. Documents available from Preece, Cardew and Rider, consulting engineers, 8-12 Queen Anne's Gate, Westminster.

20 July—New Zealand. Supply of total of 1,300 potentiometers and 450 resistors to various specifications for Director-General (Stores Div.), G.P.O., Wellington. Tender No. P. and T. 150/8007. B.o.T. (Ref.: ESB 12890/55).*

26 July—Brazil. Supply of equipment, including transformers, fuse switches, lightning conductors, cable, insulators, etc., for Quarai transmission lines, Rio Grande do Sul. Tenders invited by Comissao Estadual de Energia Eletrica. B.o.T. (Ref.: ESB 11487/55).*

28 July—India. Manufacture and supply of ten-station service cum earthing transformers for Howrah, Barhi, Caya, Patna and Dahmiangar substations. Tender No. ED 713-1. Chief Electrical Engineer, Damodar Valley Corpn., Anderson Hse, Alipore, Calcutta. B.o.T. (Ref.: ESB 12228/55).*

29 July—Australia. Supply of 10,000 yd of 11 kV underground cable and 33 kV cable terminations. Contract E.11/55. Brisbane City Council's Dept. of Electricity, City Hall, Brisbane. B.o.T. (Ref.: ESB 12498/55).*

29 July—South Africa. Tenders (No. C.9222) invited for supply of traction substation equipment, including switchgear, transformers, circuit-breakers, rectifiers, generator sets, etc. Stores Dept., S. African Railways, Johannesburg. B.o.T. (Ref.: ESB 12077/55).*

3 Aug.—Uruguay. Erection and laying of two groups of single-pole underground cables, low-pressure, oil-immersed, for 150 kV tension between phases, including provision of all accessories and equipment for maintenance. Specif. No. 2382. Administracion General de las Usinas y los Telefonos del Estado. B.o.T. (Ref.: ESB 11151/55).*

11 Aug.—Brazil. Comissao Estadual de Energia Eletrica inviting tenders for supply of necessary equipment for transformer substation, joining two hydro-electric grid systems, at Cruzeiro. B.o.T. (Ref.: ESB 11881/55).*

17 Aug.—S. Rhodesia. Supply of outdoor type 3-phase power transformers tap changing and automatic voltage regulating equipment (contract E.187/1955) for City of Bulawayo's Electricity Dept. B.o.T. (Ref.: ESB 12149/55).*

30 Aug.—New Zealand. Manufacture, supply, etc., of 400 V switchgear of single busbar indoor metal-clad type for Atiamuri power station. Contract No. 276. State Hydro-Electric Dept., Wellington. B.o.T. (Ref.: ESB 12828/55).*

31 Aug.—New Zealand. State Hydro-Electric Dept., Wellington, invites tenders for supply of 400 V switchgear for Atiamuti power station. Documents from Dept.

7 Sept.—Australia. Supply, erection, etc., of 15,000 kV steam turbo-alternator for Capricornia Regional Electricity Board. Specif. No. 500. State Electricity Commission of Queensland, Scottish Union Hse, Eagle St, Brisbane. B.o.T. (Ref.: ESB 11609/55).*

13 Sept.—New Zealand. Supply of one 50,000 kVA 220/110/11 kV transformer bank and spare unit for Kikiwa substation for State Hydro-Electric Dept., Wellington. Documents available from N.Z. Govt. Offices in London.

20 Sept.—New Zealand. Tenders (No. 273) invited for supply of four single-phase double wound transformer units each 3,333 kVA 110/6·35 kV, 50 cycles, outdoor type, oil immersed, self cooled and tap changing on load. Required for Kinleith substation. State Hydro-Electric Dept., Wellington. B.o.T. (Ref.: ESB 12159/55).*

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, 21 June

	£ per ton	Weekly change £	Price last year £
COPPER, standard class A (settlement)	350	+6	239½
„ (3 months)	338	+7½	237½
R.S.T. (Rhodesian Selection Trust) group price*	280	—	—
LEAD, refined pig, min. 99·97% purity (cash)	103½	+1½	96½
„ (3 months)	103	+⅜	94½
TIN, refined, min. 99·75% purity (settlement)	726	−2½	727½
„ (3 months)	726	−2½	726
ALUMINIUM, ingots 99·99·5%	163	—	156
ZINC, virgin, min. 98% purity (cash)	92	−½	79
„ (3 months)	90½	−2	79½
RUBBER No. 1, RSS, spot (per lb.)	35⅝d.	+2⅝d.	19⅝d.
„ c.i.f. basis, ports, Aug. (per lb.)	31½d.	+1½d.	19 11/16d.
ARMOURING:			
Galv. Steel Wire (0·104 in.)	54	+½	52
Mild Steel Tape (0·014 in.)	41½	—	40½

(*Fixed price c.i.f., U.K. originally operative for 30 days from 9 May to "consumers willing to instil a degree of stability into the resale price." Pending new notification, price subject to change at 24 hr. notice.)

Contracts Placed

Bridgwater T.C. Lighting and power installation in council houses, J.V., £2,315; street lighting equipment and installation, General Electric Co.

Croydon. Rewiring in admin. block at Mayday Hospital (extension of existing contract), W. Steward and Co., Ltd., £11,897.

Hull. Installation in 195 dwellings on Longhill estate, James Todd; same in 123 dwellings on same estate, Booker and Tarran Ltd.

Kidsgrove U.D.C. Equipment and installation of same for street lighting in Newchapel area. British Thomson-Houston Co. Ltd., £7,133.

Newbury T.C. Installation in 76 houses at Skyllings, London Rd, R. J. Hewett (Newbury) Ltd.

Newcastle-on-Tyne T.C. Installation in new eye dept. at Walkergate Hospital, Veale-Nixon Ltd., £4,649.

Gazette Announcements

COMPANIES ACTS

Air Treatment Engineering Co., Ltd. Meetings of creditors and contributories are to take place today (23 June) at Law Inst., Albion Place, Leeds, at 11 a.m. and 11.30 a.m. respectively.

Fieldson's Service Ltd. Meetings of creditors and contributories will be held at Inveresk Hse (Room 401), Strand, London, W.C.2, tomorrow (24 June) at 10.15 a.m. and 10.45 a.m. respectively.

Henray Electrical Co., Ltd. Last day for receiving proofs in respect of intended dividends, 30 June. Liquidator is D. Morgan, 100 Park St, Grosvenor Sq, London, W.1.

Horace Guest Ltd. First and final dividends of 3d. in £ payable at Office of Official Receiver and Liquidator, Inveresk Hse, 346 Strand, London, W.C.2, on 16 June, or any subsequent day except Sat. between 11 a.m. and 2 p.m.

Reproducers (Electronic) Ltd. Winding-up order made on 13 June. Petition presented on 20 May.

A. G. Wireless and Electrical Co., Ltd. Meeting of members will take place at Adelaide Hse, London Bridge, E.C.4, on 18 July at 2 p.m. to receive liquidator's report.

Voluntary Liquidation

South Essex Electric Installations Ltd. At statutory meeting of creditors statement of affairs was presented showing liabilities amounting to £1,927, of which £1,658 was due to trade creditors. Assets of book value of £1,196 were estimated to realise £648, but after allowing £38 for preferential claims, there were net assets of £610, or deficiency as regards creditors of £1,317. Resolution was passed for appointment of Mr V. L. Bell, acc., 141 Moorgate, London, E.C.2, as liquidator, with a committee of inspection.

BANKRUPTCY ACTS

Intended Dividends

Birmingham. Arthur Fielder, trading as A. Fielder and Co., radio and electrical retailer, at 314 Shortheath Rd, Erdington, and 4 Cooksey Lane, Erdington. Last day for receiving proofs, 2 July. Trustee is R. K. Clark, Official Receiver, Somerset Hse, 37 Temple St, Birmingham.

Order of Application for Discharge

Brentford. Lionel J. Quick, electrical distributor trading at 2 The Mall, Ealing, W.5. Order dated 13 May. Discharge suspended for 12 months and that he be discharged as from 13 May, 1956.

BUSINESS PROSPECTS

Home

Altrincham. Factory and offices to be built for A. Gunn and Co., Ltd., Bold St, on Atlantic trading estate.

Armagh. Approval granted for erection of cinema in Granemore Rd for C. J. Mallon, Keady.

Belfast T.C. Applications to be made to borrow £234,000 for erection of intermediate school at Orangefield.

Billingham-on-Tees. Plans approved for £100,000 apprentice training school in Belasis Lane, proposed by I.C.I. Ltd.

Bolton T.C. Erection of 12 dwellings and six shops in Breightmet Neighbourhood unit. Housing Director, Town Hall.

Boston T.C. Another 4 shops, 4 houses and 2 flats to be built at junction of Ingram and Shaw Rds.

Bradford. Erection of St. Francis's R.C. primary school off Myers Lane. Rev. D. A. Kennedy, The Presbytery, 4 Norman Ave, Eccleshill.

Brandon (Dur) U.D.C. Revised estimates approved for 80 houses at Brandon and 34 at Esh Winning at £109,428 and £44,632 resp.

Buxton T.C. Erection of 50 houses on Victoria Park estate. A. C. W. Ryland, Borough Engineer, Town Hall.

Chelmsford. Industrial estate to be developed at Widford Hall Farm. Strutt and Parker, 49 Russell Sq, London, W.C.1, are surveyors.

Co. Down. Construction of 160 dwellings at Holywood (Redburn). N.I. Housing Trust, 12 Hope St, Belfast.

Crawley. K.D.G. Instruments Ltd. are to erect new factory on industrial estate to cost about £70,000. Architect is W. H. Scanlan, 56 Buckingham Gate, London, S.W.1.

Dagenham. Plans submitted for erection of factories on Hainault industrial estate for B. Berger and Co., Ltd., and for the Art Steel Equipment Co. Ltd.

Dartford T.C. Erection of 49 dwellings on Temple Hill Neighbourhood unit. Borough Surveyor, The Bridge Hse.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Supersil. 729,336. Class 9. Wire covered with synthetic enamel. W. T. Henley's Telegraph Works Co., Ltd., 51/53 Hatton Garden, E.C.1.

Tor. 736,109. Class 9. Electric kettles. South Western Electricity Board. Electricity Hse, Colston Ave, Bristol 1.

Electrocom. B.739,077. Class 9. Telephone instruments and apparatus, etc. Modern Automatic Telephones Ltd., Telesound Hse, 101 Tottenham Ct Rd, W.1.

Roadmaster. 734,610. Class 9. Fittings for use with starter batteries, battery chargers, etc. Walker-Tyseley (Electrical) Ltd., 264 Kings Rd, Tyseley, Birmingham 11.

Isolector. 740,493. Class 9. Circuit breakers. English Electric Co., Ltd., Queens Hse, 28 Kingsway, W.C.2.

Mithras. 736,971. Class 11. Lighting installations and parts. Soho Electrical Services Ltd., 6 Soho St, W.1.

Boardette. 739,072. Class 11. Electrically heated cupboards. James Stott and Co. (Engineers) Ltd., Vernon Works, Lee St, Oldham, Lancs.

Pyrad. 740,086. Class 11. Installations for heating. Pyrad Electric Ltd., Imperial Court, Basil St, S.W.3.

Doncaster. New secondary modern school at Bentley estimated to cost £160,000.

Durham. Gas lighting at Neasham county schoo. to be replaced by electricity. It is also proposed to renew electrical installation at N.E. Div. Education Offices.

Edinburgh. Dean of Guild Court has granted warrant for 200,000 sq ft factory for William Thyne Ltd., of Marconville Rd, on Lighthill industrial estate. Estimated cost is £450,000.

Falkirk T.C. Erection of technical college on part of Randyford Farm, Grangemouth, has been approved.

Flintshire. Erection of primary school at Sandycroft, and secondary modern school at Penley. W. Griffiths, county architect, Llwynegrin, Mold.

Frimley and Camberley (Sur). Instalment of county secondary school to be included in 1955-56 building programme. Estimated cost £148,080.

Glamorgan. Factory proposed on Hirwaun trading estate by Lastex Yarn and Lactron Thread (Overseas) Ltd. will cost about £250,000. Architects are Wallis, Gilbert and Partners, 5 Cromwell Rd, London, S.W.7.

Haydock (Lancs). Factory to be built in Kilbuck Lane by Thomas Crompton and Sons of Gerrard St, Ashton-in-Makerfield. Consulting engineers are C. S. Abbott and Son, North Parade, St Mary's Parsonage, Manchester.

Hebburn U.D.C. Plans approved for proposed R.C. grammar technical school in Mill Lane.

Hertfordshire. Borg-Warners Ltd. to build £250,000 factory and offices at Letchworth. Plans are by Howard Souster and Fairbairn, 81 Piccadilly, London, W.1.

Also, sketch plans submitted for completion of N. Herts Technical College, estimated to cost £284,775.

Holland. First instalment of new county offices at Boston proposed. They are estimated to cost £50,000.

Hull. British Industrial Solvents Ltd., Hedon, propose erection of £750,000 new plant. Work to begin soon.

Also, new infants' school proposed at junction of Williamson and Great Thornton Sts.

Ipswich. Offices and light industrial buildings proposed on Whitton White House estate by Danish Bacon Co. (Industries) Ltd.

Isle of Ely. New secondary modern school proposed at Littleport.

Kesteven. First stage of scheme to build new county offices at Sleaford will cost about £40,000.

Kirkcaldy. M. Nairn and Co. Ltd., Victoria Rd, to build a factory of Smeaton Field, Hayfield Rd.

Llanelly T.C. Erection of 24 houses on Box site. J. E. Thomas, Borough Architect, 5 Goring Rd.

London. Block of offices proposed for site at Austin Friars, E.C.2, is estimated to cost £150,000. Quantity surveyors are John Leaning and Son, 28 John St, W.C.1.

Long Eaton U.D.C. Construction of 34 houses on Petersham estate. F. Turner, Engineer and Surveyor, Town Hall.

Loughborough. County council to build £50,674 Thorpe Acre primary school, and R.C. secondary modern school to be built also.

North Riding. Quantity surveyors for new primary school at Skelton are Gleeds of 8 St James St, Derby.

Northallerton R.D.C. Erection of 39 houses at Cherrygarth, Romanby. Clerk of Council, The Old Vicarage.

Nuneaton. Proposed new Ald Smith school at Stockingford will cost about £222,000.

Oxford. University Press planning new printing premises costing about £200,000. Plans by Booth and Ledeboer, 8 Blackhall Rd.

Rotherham. Architects for factory in Brinsworth St for Montgomery, Skinner and Co., Pagoda St, Sheffield, are James Totty and Co., Imperial Buildings.

Royton U.D.C. Erection of 54 houses and flats on Flake Lane estate. Council's Architects, Heywood and Ogden, 12 Clegg St, Oldham.

Sheffield. First part of new Teaching Hospital on Glossop Rd site proposed by United Sheffield Hospitals' Board. Scheme will cost total of about £2m.

Stevenage. Sketch plans in hand for erection of girls' grammar school at Ashtree Wood. Cost estimated at £198,010.

Also, extensions estimated to cost £90,000 to be carried out by British Visqueen Ltd., Six Hills Way. Gardiner and Theobald of 48 Bedford Sq, London, W.C.1, are quantity surveyors.

Stirling. Logie and Co. Ltd. to alter 63 Barton St for showrooms. Scheme approved by Dean of Guild Court.

Stirlingshire. Additions to their Grangemouth works costing £120,000, proposed by British Petroleum Co., Ltd., Avon Hall, Bo'ness Rd.

Stoke. Tilsey and Lovatt, London Rd, Trent Vale, planning to erect new factory on Newstead Farm trading estate.

Sutton (Sur). Additional accommodation at Nonsuch county girls' school is estimated to cost £37,482.

Swindon T.C. Two factories costing £115,000 and £50,000 resp. to be built on industrial estate.

Thirsk (Yorks). Construction of grammar and modern school at Thirsk for North Riding. Quantity surveyors are Clevely and Bass, 47 Gordon Sq, London, W.C.1.

Tynemouth T.C. Construction of 26 houses on three estates. Borough Surveyor, 16 Northumberland Sq, North Shields.

York T.C. Erection of block of 30 flats in Navigation Rd, E. Firth, City Architect, 8 St. Leonard's Place.

Overseas

Australia. Representation on commission or consignment basis of U.K. makers of heavy laundry machinery wanted by Alfred A. Schaffer and Co. Pty. Ltd., 18 Railway Parade, West Perth.

Costa Rica. Costa Rica Machinery Co. Inc., P.O. Box 1328, San José, would like to represent U.K. manufacturers of aluminium cable and wire and iron and steel telegraph poles.

New Zealand. Agencies requested for all kinds of coal utilisation plant, including power generators, pulverisation plant, etc., plant for commercial utilisation of fissionable materials, and passenger escalators and commercial lifts. Mr John Carpenter, director of J. H. M. Carpenter Ltd., 218 Broadway, Newmarket, Auckland, is visiting this country in August with that object.

U.S.A. Quotations from U.K. manufacturers of electronic equipment and parts required by Swan Distributing Co., Inc., Box 2698, Jackson, Mississippi. Type of equipment not stated.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons, Ltd., 116 Chancery Lane, W.C.2.

B. J. and W. Automation Ltd., Argyle Hse, 29/31 Euston Rd, N.W.1. Manufacturers of and dealers in electrical, mechanical, cinematographic, photographic, wireless, television and radio apparatus and equipment, etc. Nom. cap.: £100. Dirs.: W. H. Berriedale-Johnson and C. D. Sparks.

Graetz (Concessionaires) Ltd., Assemblers and factors of electrical, radio, television, engineering and all other products and equipment of the Graetz Company of Germany, etc. Nom. cap.: £100. Dirs.: to be appointed by subscribers. Subs.: S. Geld and M. Donn, 193 Mare St, E.8.

Webcor (Great Britain) Ltd., Manufacturers of and dealers in mechanical and electrical equipment and components for recording and reproducing sound, radio and electronic apparatus, etc. Nom. cap.: £1,000. Dirs.: to be appointed by subscribers. Subs.: E. Hardy, Orchard Bank, 180 Main Rd, Sidcup and J. T. Brown, 23 St. Peters Ave, Walthamstow, E.17.

Period Designs Ltd., 120 Dawes Rd, S.W.6. Manufacturers and assemblers of and dealers in electric, gas and oil lamps, quartz lamps, and generally electrical and gas plant, etc. Nom. cap.: £900. Dirs.: A. F. Osborne, W. Johnson and J. M. M. Shaw.

W. R. Young (Stafford) Ltd., 29a Friars Rd, Stafford. Manufacturers of and dealers in automobile accessories and equipment, including batteries, accumulators, etc. Nom. cap.: £1,000. W. R. Young signs as director. Subs.: W. E. Mountford and Winifred M. Nixon, Paramount Chambers, 6 Market Sq, Stafford.

Castle Sports Ltd., Dealers in, repairers and manufacturers of radio, television, gramophones and electrical goods, etc. Nom. cap.: £10,000. Dirs.: E. L. G. Loader, 25 Parkway, Seven Kings, Essex and A. E. Whybrow, Wyverstone Lodge, Hadleigh Rd, Leigh-on-Sea, Essex.

S. Korobuk Ltd., 126 Bishopsgate, E.C.2. Manufacturers of and dealers in tape and wire recording machines and apparatus, radio, television and electrical apparatus, etc. Nom. cap.: £1,500. Dirs.: S. Korobuk and Iris M. D. Korobuk, E. A. Moore and Annie Korobuk.

G. A. Stanley Palmer Ltd., Maxwell Hse, Arundel St, W.C.2. To acquire from Geo. A. S. Palmer goodwill and assets of business of electronic engineer hitherto carried on by him at Arundel St, Strand, W.C.2, as "G. A. Stanley Palmer" "Electronic and Musical Export Co.," "Emeco Electronics Co." and "Constanta Components." Nom. cap.: £10,000. Dir.: G. A. S. Palmer, Maxwell Hse, Arundel St, W.C.2.

Alton (Engineers) Ltd., 65 Park Lane, Oldbury, Worcs. Manufacturers of accessories for the motor, electrical and general engineering trades, etc. Nom. cap.: £2,000. Permt. dir.: L. Lamb, 130 Hamstead Hall Rd, Handsworth Wood, Birmingham.

Nimar Ltd., 2 Exhibition Rd, S.W.7. Manufacturers of and dealers in electrical goods, musical instruments, etc. Nom. cap.: £100. Dirs.: to be appointed by subs. Subs.: N. Cole and Mrs M. Cole, 2 Beaufort Gdns, S.W.3.

Cooper Components Ltd., Brook St, Melton Mowbray, Leics. Dealers in, manufacturers and repairers of automobile, electrical, radio, electrical engineering and aeroplane accessories, etc. Nom. cap.: £2,000. Dir.: C. Cooper.

Lynch and Baker Ltd., 23 Oakleigh Court, Burnt Oak, Edgware, Middlesex. Mechanical, general and electrical engineers, model and pattern makers, woodworkers, etc. Nom. cap.: £1,000. Dirs.: P. Lynch and J. W. Baker.

Floataire Ltd., Brook St, Melton Mowbray. General, precision and electrical engineers, etc. Nom. cap.: £10,000. Dirs.: C. Cooper, W. Gray, and W. Thorne.

Roger and Martin Ltd. Mechanical, electrical, chemical and general engineers, etc. Nom. cap.: £100. Dirs.: Elsie R. L. Bowerman and Grace E. Devetta, Subs.: A. H. Taylor, 27 Exeter Close, Tonbridge, Kent; and Edna J. Upton, 4 Station Rd, N.3.

A. T. Snowden (Luton) Ltd., 171 Dunstable Rd, Luton. Radio, television, electrical, tele-communication and mechanical engineers, etc. Nom. cap.: £10,000. Dirs.: K. F. Jackson and Mrs G. M. Jackson, 20 Browning Rd, Harpenden; R. A. K. Coe and Mrs R. J. Coe, 18 The Green, Leagrave, Luton.

Pinnacle Electronic Products Ltd. Nom. cap.: £10,000. Directors: F. D. Pratt, Welling Barn Cottage, Charlwood, Surrey; and D. M. S. Toms. Sub.: Betty R. Evans, 5 Paper Buildings, Temple, E.C.4.

Radio and Television Distributors Ltd. Nom. cap.: £1,000. Dirs.: to be appointed by subs. Subs.: M. Donn, 35 Ellingfort Rd, E.8, and S. Gold, 4 Atherden Rd, E.5.

Louvett and Co., Ltd., 19 Buckingham St, W.C.2. Manufacturers of and dealers in articles and components of plastic materials, electrical goods, domestic goods, jewellery, fancy goods, etc. Nom. cap.: £100. Dirs.: to be appointed by subs.

Koswa Ltd., 6 High St, Alton, Hants. Import, export, and dealers in valves and other components of heating installations; ironfounders, mechanical engineers, etc. Nom. cap.: £1,000. F. Buckham, Mount Dassel, Kings Rd, Alton, Hants, signs as director.

Airflow Developments Ltd., 121 New Rd, Booker, High Wycombe, Bucks. Manufacturers of and dealers in electrical instruments, plant, machinery, appliances, wireless and television sets, etc. Nom. cap.: £2,000. Dirs.: A. C. Wilson and Mrs N. L. Wilson.

Batty's (Rhyl) Ltd., 21 Bodfor St, Rhyl, N. Wales. To take over business of electrical contractors and retailers of electrical goods and appliances, fancy goods and jewellery carried on at Rhyl as A. Batty and Co. Nom. cap.: £5,000. Permt Dirs.: A. Batty and Margaret Batty.

Balun Ltd., 175 Uxbridge Rd, Hanwell, W.7. Manufacturers of and dealers in electrical, optical, mechanical and radio measuring instruments, etc. Nom. cap.: £200. Permt dir.: R. H. Hatfield.

Mortimer Gall (Heating) Ltd., 115/117 Cannon St, E.C.4. Installing, maintaining and supplying heating apparatus, etc. Nom. cap.: £100. Dirs.: J. Mortimer-Hawkins and R. G. Chinn.

TRADE NOTES

Change of Name. The title of W. Edwards and Co. (London) Ltd., has been changed to Edwards High Vacuum Ltd.

Licence Agreement. Albert Mann's Engineering Co., Ltd., Basildon Industrial Estate, Essex, have concluded an agreement with an American firm to manufacture in Britain the "Stanat" combination rolling mills.

Agencies. The Magnetic Equipment Co., Ltd., are now represented in Holland by Berg and Burg, De Ruyterkade, 141–142, Amsterdam; in Belgium by Willy Depireux, Rue Hector Denis 74, Mont-Sur-Marchienne, Charleroi, and in the Republic of Ireland by the Modern Plant and Appliance Co., 64 Aungier St, Dublin.

Holidays. The East Pilton works of Bruce Peebles and Co., Ltd., will be closed from 1 July to 18 July.

The Birmingham office and works of William McGeoch and Co., Ltd., will be closed from 22 July to 8 Aug.

Export Company. Flexello Castors and Wheels Ltd. have formed a separate export company, Flexello Castors (Export) Ltd., to deal exclusively with that side of the business. The company will operate from Bath Rd, Slough Trading Estate, Bucks.

Beama Contract Price Adjustment Formulæ.—*For Electrical Machinery and Equipment.* For purposes of calculating variations in: (*a*) "Rates of Pay"—the rate of pay for adult male labour at 18 June, 1955, shall be deemed to be 162s.; (*b*) "Cost of Material"—the index figure for materials used in the Electrical Machinery Industry published in the Board of Trade Journal on 18 June, 1955, is 177·8.

For Turbo-Generating and Allied Plant. For purposes of calculating variations in: (*a*) "Rates of Pay"—the rate of pay for adult male labour at 18 June, 1955, shall be deemed to be 162s.; (*b*) "Cost of Material"—the index figures published in the Board of Trade Journal on 18 June, 1955, are: Materials used in Mechanical Engineering Industries—162·5, "Blast Furnaces and Iron and Steel Melting and Rolling (40 and 41)"—147·7. The price of brass condenser tubes, ¾ in. o/d 18 s.w.g. published in *The Metal Bulletin* on 17 June, is 4s. 4½d. per lb.

For Outstanding Contracts covered by the B.O.T. Intermediate Products Index. For purposes of calculating variations in (*a*) "Rates of Pay"—the rate of pay for adult male labour at 18 June, 1955, shall be deemed to be 162s.; (*d*) "Cost of Material"—the index figure for Intermediate Products published in the Board of Trade Journal on 18 June, 1955, is 373·3 (provisional).

MEETINGS TO NOTE

WEDNESDAY, 22 JUNE

INST. OF PHYSICS (Non-Destructive Testing). Summer meeting in Glasgow until 26 June.

SATURDAY, 25 JUNE

A.S.E.E. (Bournemouth) and E.A.W. "Electrical Installations—from the Woman's Viewpoint." Grand Hotel, 7.15 p.m.

MONDAY, 27 JUNE

B.E.P.C. Opens at Brighton, continuing until 1 July.

B.E.P. Convention
Brighton June 27–July 1
See you on
HENLEY
Stand No 37
BRIGHTON
ROCK
W. T. HENLEY'S TELEGRAPH WORKS CO. LTD., 51-53, HATTON GARDEN, LONDON, E.C.1

First in the World

METROVICK TRANSVA METER FOR

Direct measurement of kVA m.d.

- Employs an integrating meter of the conventional pattern with no additional gears or moving contacts.
- Measures accurately at all power-factors (leading or lagging) and with load unbalanced.
- Is unaffected by normal variations in voltage, frequency and temperature.
- Can be supplied for kVAh and/or kVA demand.
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Write for leaflet 356/11-1.

Visit our stand No. 24, Row "F," at the British Instruments Industries Exhibition.

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ELECTRICAL CO LTD · TRAFFORD PARK · MANCHESTER, 17

Earl's Court, London, from 28th June to 9th July, 1955.

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For Meticulous Metering

G/A303

CLASSIFIED ADVERTISEMENTS

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 32s. 6d. per inch, and all other classified advertisements at 2s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

TENDERS INVITED

AIREBOROUGH URBAN DISTRICT COUNCIL

INSTALLATION OF CLASS "B" STREET LIGHTING IN OVER LANE, TOWN STREET, AND LAYTON ROAD, RAWDON

TENDERS are invited for the supply and installation of Class "B" Mercury Vapour Street Lighting in Over Lane, Town St and Layton Rd, Rawdon.

Separate Tenders are invited as follows:

1. Supply and erection of columns and brackets and fitting and wiring of lanterns to columns, etc.
2. Supply of lanterns and all auxiliary gear.

A firm may tender for both, but the Council reserve the right to accept separate Tenders from different firms.

Copies of the plan, instructions to persons Tendering, Specifications, Bills of Quantities, Forms of Tender and Schedule of rates and prices may be obtained from, and general conditions of contract seen at, the office of the Engineer and Surveyor to the Council at the address below, on payment of a deposit of Two Guineas, which will be returned on receipt of a bona-fide Tender or the return of the documents.

Tenders enclosed in a plain, sealed envelope endorsed "Tender for Street Lighting" must be delivered to the undersigned not later than midday on Tuesday, 12 July, 1955.

The Council does not bind itself to accept the lowest or any Tender, and the acceptance of a Tender or Tenders will be subject to the obtaining by the Council of any requisite consents.

RALPH H. HULME,
Clerk of the Council.

Council Offices,
Micklefield House,
Rawdon, Nr. Leeds.
17 June, 1955. (T 305)

COUNTY BOROUGH OF BLACKBURN

ELECTRICAL STREET LIGHTING EQUIPMENT

TENDERS invited by 14 July for supply of materials for conversion of side-street lighting from gas to electricity during the period August 1955—June 1956. Materials comprise Class B narrow base concrete columns, lanterns, swan-neck brackets and boxes, of which full details can be obtained from the Borough Engineer, Town Hall, Blackburn.

CHAS. S. ROBINSON,
Town Clerk.
(T 318)

CITY OF MANCHESTER

THE Education Committee invited tenders for ELECTRICAL HEATING INSTALLATION required for the Play Shed at Crumpsall Open-Air School, Manchester. Specification and drawings may be obtained from the City Architect, P.O. Box No. 488, Town Hall. Tenders, sealed in endorsed envelopes must be delivered before 10 a.m. 4 July, 1955.

PHILIP B. DINGLE,
Town Clerk.
13 June, 1955. (T 258)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

ELECTRIC LIGHTING AND HEATING INSTALLATION AND OTHER WIRING AT KILMELFORT POWER STATION AND LOCH TRALAIG DAM, ARGYLLSHIRE

TENDERS are invited for the above-mentioned installation and other wiring services. Copies of the Tender Document may be obtained on application with a cheque for £2. 2s. (returnable) to the Engineers, Messrs Strain and Robertson, 5 Park Circus, Glasgow C.3. The Board do not bind themselves to accept the lowest or any Tender.

H. W. SIMPSON,
Secretary.
16 Rothesay Terr,
Edinburgh. (T 304)

CITY OF MANCHESTER
Housing Committee

TENDERS are invited for Electrical Installations in connection with the following housing schemes:

Contract No. 228, 49 Flats and A.P.Ds., Floats Hall Rd, Wythenshawe.
Contract No. 229, 58 Flats and A.P.Ds., Greenbrow Rd, Wythenshawe.
Contract No. 230, 43 Flats and A.P.Ds., Colshaw Rd, Wythenshawe.

Tenders Forms and Schedules may be obtained on application to the Director of Housing, Town Hall, Manchester 2, and must be returned in a sealed official envelope, addressed to the Chairman of the Housing Committee, to be received at the office of the Town Clerk not later than noon on Monday, 4 July, 1955.

PHILIP B. DINGLE,
Town Clerk.
(T 257)

STEPNEY M.B.C.

LANCE STREET HOUSING SCHEME

TENDERS are invited for:

(a) Installation of Electric Lighting and Power Points for 30 dwellings.
(b) Providing and installing complete, one Electric Passenger Lift.

Forms of Tender with conditions, etc., obtainable from the Borough Engineer and Surveyor, Municipal Offices, 227/233 Commercial Road, E.1. In case of Tender (a) only, the payment of a deposit of £5. 5s. will be required.

Closing date for tenders: Monday, 11 July, 1955.

WILFRED REEVE,
Town Clerk.
(T 259)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

INVERNESS—ELGIN REINFORCEMENT

TENDERS are invited for the supply and construction of a 132 kV double circuit steel tower transmission line between Nairn and Keith. Copies of the Tender Document may be obtained on application to the Engineers, Messrs. Merz and McLellan, 72a George St, Edinburgh 2.

Applications should be accompanied by a cheque for £2. 2s. (returnable). The Board do not bind themselves to accept the lowest or any Tender.

H. W. SIMPSON,
Secretary.
16 Rothesay Terr,
Edinburgh. (T 273)

APPOINTMENTS VACANT

Engagement of persons must be made through a Local Labour Office or Scheduled Employment Agency, if the applicant is a man aged 18-64, or a woman aged 18-59; unless the person concerned is excepted or the employment is in a managerial or professional capacity, or is otherwise excepted from the provisions of the Notification of Vacancies Order, 1952.

THE NORTH EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments subject to N.J.B. Agreement for Electricity Supply Industry:

Area Board Headquarters

FOURTH ASSISTANT ENGINEER, Operation and Maintenance Section, for general duties in System Protection Sub-Section. Applicants should possess H.N.C. or equivalent qualifications. Salary—Schedule C, Grade 6—£600/£785.

Wear Sub-Area

SECOND ASSISTANT DISTRICT ENGINEER, Jarrow District. Applicants must be qualified electrical engineers with sound practical training and experience in construction, operation and maintenance of overhead and underground networks and associated plant and equipment. Salary—Schedule A, Class E, Grade 7—£715/£760.

Tees Sub-Area

FOURTH ASSISTANT ENGINEER, Commercial Officer's Department, Stockton-on-Tees. Applicants should be suitably qualified electrical engineers, with experience in administration of a Domestic Apparatus Repairs Workshop and the servicing of all types of domestic appliances. Salary—Schedule A, Class K, Grade 13—£675/£720.

York Sub-Area

SENIOR ASSISTANT ENGINEER, York. Applicants should be qualified engineers with wide experience in all classes of electrical engineering operation and maintenance work, including installation and testing of protection equipment and plant. Salary—Schedule A, Class G, Grade 4—£975/£1,050.

Applications stating age, qualifications and experience to be received by the Secretary (Establishments), The North Eastern Electricity Board, G.P.O. Box No. 117, Carliol House, Newcastle upon Tyne, within ten days of the appearance of this advertisement.
(T 302)

SOUTH EASTERN ELECTRICITY BOARD

ASSISTANT DISTRICT COMMERCIAL ENGINEER

Eastbourne District

SALARY £595/£640 per annum under N.J.B. Class E, Grade 10. Superannuable. Applicants should be suitably qualified and have experience in installation, contracting and consumer service, including the preparation of estimates and specifications for domestic, commercial and industrial installations, and the supervision of such work.

Applications on forms from J. E. Winborne, District Manager, SEEBoard, Electric House, Grove Rd, Eastbourne, by 6 July, 1955.

SENIOR SALES REPRESENTATIVE (MALE)

Sutton District

Salary £525 x £20—£585 per annum plus London Weighting under N.J.C. Grade 2. Superannuable. The person appointed will be required to give advice on supply matters, tariffs and appliance sales and installation for domestic and small commercial consumers. Applicants must be thoroughly conversant with house wiring and all types of domestic electrical appliances and in addition to acting as an outside representative must be prepared to carry out general showroom duties in any showroom within the District.

Applications, naming 2 referees, on forms from W. B. Hayden, M.I.E.E., Sutton Manager, SEEBoard, 52/54 High St, Sutton, Surrey, by 6 July, 1955.

A. L. BURNELL,
Secretary.
(T 300)

SOUTH OF SCOTLAND ELECTRICITY BOARD

Southern Area

SECOND ASSISTANT DISTRICT ENGINEER (Berwick District). N.J.B. Grade D7, £675 x £15—£720.

THIRD ASSISTANT DISTRICT ENGINEERS (Two) (Berwick District). N.J.B. Grade D9, £595 x £15—£640.

Applicants should have a sound technical training and experience in operation and maintenance of overhead and underground distribution systems. Technical qualifications desirable. The engineers appointed will be required to reside in or near Berwick-upon-Tweed. Applications stating age, qualifications and experience should reach the undersigned by 5 July.

G. H. SANKEY,
Area Manager.

P.O. Box No. 2,
High St, Galashiels. (T 289)

CENTRAL ELECTRICITY AUTHORITY

Southern Division

APPLICATIONS are invited for the following posts:

SHIFT CHARGE ENGINEER
POOLE GENERATING STATION
S/13.678

Applicants should possess technical qualifications admitting to corporate membership of a recognised professional institution, and have had previous operating experience involving responsibility in a large modern generating station with high temperatures and pressures and preferably with pulverised fuel equipment.

Salary N.J.B. Grade J.7, £900/£975.

SHIFT CHARGE ENGINEER
OXFORD GENERATING STATION
S/13.677

Applicants should be in possession of technical qualifications admitting to corporate membership of a recognised professional institution, have had previous experience in an electricity generating station, and preferably have had manufacturing works experience.

Salary N.J.B. Grade D.7, £675/£720.

ASSISTANT ENGINEER (INSTRUMENTS)
EARLEY GENERATING STATION, READING
S/13.679

Candidates should have previous experience of modern generating station plant and a sound knowledge of instruments and other measuring apparatus used in generating stations.

Applicants should have had a sound technical training and should preferably possess qualifications leading to corporate membership of an appropriate professional institution, or hold equivalent qualifications.

Salary N.J.B. Grade G.10, £675/£720.

DRAUGHTSMAN
POOLE GENERATING STATION
S/13.676

Applicants should be experienced in the preparation and issue of diagrams, drawings and charts, and also in the maintenance of drawings filing system.

Salary N.J.C. Grade 2, £525/£585.

GENERAL ASSISTANT ENGINEERS
S/13.674

Applicants should have served an apprenticeship or had practical training suitable to the industry. They should possess a sound general and technical education and preference will be given to those possessing a Higher National Certificate (or those nearing completion of H.N.C. courses). Opportunities are available for general assistant engineers to complete their studies and gain wide experience with good prospects of promotion.

The duties of those appointed will vary, but will include as a general rule the operation and control, under supervision, of generating plant.

Vacancies also exist for those who wish to specialise in maintenance of electrical and mechanical generating plant, transmission lines, substations and cables, or generating station construction work.

Salary N.J.B. within scales £475/£640.

Special application forms for each post obtainable from P. D. A. Oliver, Divisional Secretary, 111 High St, Portsmouth, should be returned by 6 July. Please quote reference E.R. (T 313)

CENTRAL ELECTRICITY AUTHORITY

Yorkshire Division

APPLICATIONS are invited for the following appointments at Wakefield "B" Power Station. The station will have an ultimate capacity of 240 MW.

DEPUTY STATION SUPERINTENDENT

Salary £1,100/£1,200 per annum, Class H, Grade 3, National Joint Board Agreement.

Applicants should have had wide experience in the administration and operation of a large modern power station and should preferably be Corporate Members of the Institution of Mechanical Engineers and/or Electrical Engineers, or hold equivalent qualifications

MAINTENANCE ENGINEER (MECHANICAL)

Salary £900/£975 per annum, Class H, Grade 6, National Joint Board Agreement.

Applicants should have had a wide experience in the maintenance and administration of a large modern power station. Possession of recognised technical qualifications in Mechanical Engineering would be an advantage.

SHIFT CHARGE ENGINEERS

Salary £840/£900 per annum, Class H, Grade 7, National Joint Board Agreement.

Applicants should have operating experience with large capacity high pressure Turbo-Alternators and Boilers, and should preferably possess technical qualifications admitting to Corporate Membership of the Institution of Mechanical Engineers and/or Institution of Electrical Engineers.

STATION SHIFT CONTROL ENGINEERS

Salary £715/£760 per annum, Class H, Grade 10, National Joint Board Agreement.

Applicants should have had a sound training and practical experience in a modern power station control room. The possession of recognised technical qualifications in Electrical Engineering would be an advantage.

GENERAL ASSISTANT ENGINEERS

Salary £475/£520 per annum, Class H, Grade 16, National Joint Board Agreement.

Preference will be given to candidates possessing recognised technical qualifications or who are at present following a course of study with the object of obtaining such qualifications.

Housing accommodation may be available.

Application forms obtainable from Divisional Secretary (Establishments), Central Electricity House, St Mary's Rd, Leeds 7, to be returned within 14 days of the appearance of this advertisement.

G. A. VOWLES,
Divisional Controller.
(T 297)

AIR MINISTRY

require STATION ENGINEERS (G.D.) and STATION ENGINEERS (MECH.) at Royal Air Force and Ministry of Transport and Civil Aviation stations. Qualifications required (*a*) Ordinary National Certificate in Electrical or Mechanical Engineering or show that an equivalent standard of technical education has been reached; (*b*) recognised apprenticeship in electrical or mechanical engineering with firm or establishment of good repute; (*c*) three years' employment in electrical or mechanical engineering preferably on operation and maintenance of mine, factory or workshop plant and services. Preference will be given to applicants who have had supervisory duties subsequent to (*b*) and (*c*). Work will consist of installation, operation and maintenance of high and medium voltage electrical distribution systems, electrical installations, generating plant, steam and hot water heating systems and miscellaneous works plant, tools and equipment. Commencing salary according to age, qualifications and experience on range from £535 to £772. Liability for tours of duty overseas for which special allowance payable in addition to higher salary. Appointments non-pensionable. Only natural-born British subjects. Write, giving age, full details of qualifications and experience to AB.1255, Appointments Officer, Ministry of Labour and National Service, 1-6 Tavistock Sq, W.C.1. No original Testimonials should be sent. Only candidates selected for interview will be advised. (T 117)

THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY

Aldermaston, Berks

requires EXPERIMENTAL OFFICERS, for the following duties:

(1) 667/WGE/49. To assist in static strength tests of weapon assemblies and components, to carry out model experiments and to develop, maintain and use electronic recording gear.

(2) 668/WGE/49. To assist in dynamic strength tests of weapon assemblies and components and to use and maintain electronic recording gear.

The minimum qualification for both posts is Higher School Certificate (Science) or equivalent, but candidates must also have had experience of electronic instrumentation. Applicants should be at least 26 years of age. For Post (1) experience of experimental stress analysis would be an advantage. For Post (2) experience of experimental stress analysis in dynamic applications would be an advantage.

Salary: £775/£945 per annum (male). The successful applicants will be required to join the Authority's contributory superannuation scheme.

Housing: Housing accommodation will be available within a reasonable period for married officers who live outside the radius of the Establishment's transport facilities or alternatively the Authority may be able to assist successful applicants in the purchase of a house. During this period a lodging allowance may be payable.

Requests for application forms by postcard to Senior Recruitment Officer, A.W.R.E. Aldermaston, Berks, quoting the appropriate reference number. (T 268)

A CAREER AS A REGULAR ARMY OFFICER FOR QUALIFIED ENGINEERS

MECHANICAL, ELECTRICAL and ELECTRONIC ENGINEERS are required as officers in the Corps of Royal Electrical and Mechanical Engineers.

There are two methods of entry. These are either:

(1) On a short service commission (which offers a good opportunity of obtaining a permanent commission) with a gratuity of about £100 for each completed year of service on leaving

or

(2) On a Permanent Regular Commission with a valuable pension and a terminal grant of £1,000 (tax free).

Candidates must be physically fit and between the ages of 23 and 28 years old (except for those with previous service in the Armed Forces, who may be 30 years old). They must have passed or be exempt from the examinations of either the Institution of Mechanical Engineers or the Institution of Electrical Engineers, or have a University Degree in Natural Science or Engineering. In addition, 2½ years' experience as an engineer (or 1½ years in the case of University graduates) is normally required. Additional seniority is given for an honours degree and for approved engineering experience.

The pay which Army officers may expect is according to the following table:

Rank	*Normal Age*	*If Single* £	*If Married* £
Lieutenant	23	686	823
Lieutenant	25	723	860
Captain	27	866	1,005
Major	34	1,193	1,330
Lt-Colonel	42	1,512	1,640
Colonel	45	1,795	1,922
Brigadier	49	2,068	2,187
Major General	49 or over	2,634	2,744

Note.—This is the U.K. scale; there are various additions in certain overseas station.

(In this table the figures of a single officer's pay include an element for food and accommodation which are normally provided in kind. This has been made to provide a direct means of comparison with civilian scales of pay).

For further details please write to:

The War Office (P.A.6(*b*)), London, S.W.1, and quote this announcement.

(T 276)

EASTERN ELECTRICITY BOARD

FITTER (ELECTRICAL)
St. Albans District, Northmet Sub-Area
112/55.R

RATE of pay, at present 4s. 1d. per hour for a 44-hour week, and conditions of service will be in accordance with the N.J.I.C. Agreement for the Electricity Supply Industry.

Apply by letter, to the District Manager, Eastern Electricity Board, St. Peter's St, St. Albans, Herts, within 14 days of the appearance of this advertisement. (T 316)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

Central Gloucestershire Sub-Area

PRINCIPAL ASSISTANT (SUB-AREA CENTRAL ACCOUNTS DEPARTMENT)

Duties will involve assistance to the Sub-Area Accountant appertaining to all aspects of the work in the Accounts Department. Applicants should possess a recognised accountancy qualification and have had extensive accountancy and administrative experience. Salary £960/£1,080 per annum (N.J.C. Grade 8).

Apply in writing, within fourteen days, stating age, qualifications and experience, present position and salary to Mr S. Raybould, Sub-Area Manager, Midlands Electricity Board, 126 London Rd, Gloucester.

Worcester and District Sub-Area

THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER
(Redditch District)

Applicants should have had a sound technical training and experience in the sale and installation of domestic and commercial electrical equipment and the wiring associated therewith. The duties also include advising consumers in respect of new supplies, extension and alterations. Experience in Rural Development desirable. Technical qualifications an advantage. Salary £595/£640 per annum (N.J.B. Grade E.10).

Apply in writing, within fourteen days, stating age, qualifications and experience, present position and salary to Mr R. Mallet, Sub-Area Manager, Midlands Electricity Board, Whittington, Worcester.

South Staffs. and North Worcs. Sub-Area

THIRD ASSISTANT DISTRICT COMMERCIAL ENGINEER
(Stourbridge District)

Applicants should have had a sound technical training with practical experience in the sale and installation of domestic and commercial elecrical equipment and the wiring associated therewith. Experience of estimating for installation work and the possession of appropriate technical qualifications will be considered an advantage. The duties will include the supervision of contracting work, advising consumers in respect of new supplies, extensions, alterations and estimating for same. Salary £595/£640 per annum (N.J.B. Grade E.10). (The classification for the year 1954/55 is based on unit sales of 94 million units—devalued).

GENERAL ASSISTANT DISTRICT ENGINEER
(Stourbridge District)

Applicants should have suitable technical qualifications and training in engineering duties associated with electrical distribution systems. Salary £475/£520 per annum (N.J.B. Grade E.13). (The classification for the year 1954/55 is based on unit sales of 94 million units—devalued.)

Apply in writing, within fourteen days, stating age, qualifications and experience, present position and salary to Mr T. G. Keeler, Sub-Area Manager (Ref. CW), Midlands Electricity Board, P.O. Box No. 9, Toll End Rd, Tipton.

Wolverhampton and District Sub-Area

GENERAL ASSISTANT DISTRICT COMMERCIAL ENGINEER
(Wolverhampton District)

Applicants should have had a sound technical training and experience in industrial, commercial and domestic installations. Duties will include supervision of contracting work and consumers' service. Technical qualifications desirable. Salary £675/£720 per annum (N.J.B. Grade H.11).

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Apply in writing, within fourteen days, stating age, qualifications and experience, present position and salary to Mr D. Holt, Sub-Area Manager, Midlands Electricity Board, 83 Darlington St, Wolverhampton.

Birmingham and District Sub-Area

GENERAL ASSISTANT ENGINEER
(Technical Section, Sub-Area Engineer's Department)

Experience necessary in the preparation of specifications, layout of substations, and the planning of, and analysis of loading conditions on, High Voltage and Low Voltage Transmission and Distribution Systems. Technical qualifications desirable. Salary £555/£600 per annum (N.J.B. Grade M.18).

Apply in writing, within fourteen days, stating age, qualifications and experience, present position and salary to Emil Braathen, Sub-Area Manager, Midlands Electricity Board, 14 Dale End, Birmingham 4.

A. STEPHENS,
Secretary.
(T 314)

CENTRAL ELECTRICITY AUTHORITY
Eastern Division

APPLICATIONS are invited for the following post at Ipswich Constantine Rd, Generating Station:

STATION SHIFT CONTROL ENGINEER

Salary Class D, Grade 10, £555 x £15—£600 per annum.

Applicants should have reached the standard of Ordinary National Certificate in Electrical Engineering, or its equivalent, have experience in the operation of a switchboard at a Generating Station and be fully conversant with High Voltage Switching operations and protective systems.

Applications stating age, details of experience and qualifications, should be sent to the Controller, Central Electricity Authority, Eastern Division, Northmet House, Southgate, N.14, to arrive not later than 1 July, 1955.

W. N. C. CLINCH,
Controller.
(T 301)

GLOUCESTERSHIRE COUNTY COUNCIL

APPLICATIONS are invited from suitably-qualified candidates for the post of County VISUAL AIDS TECHNICIAN (full or part-time). Duties will include maintenance of visual aids and radio equipment in schools. Salary will be in accordance with A.P.T. Grade II of the National Scales (i.e. £560 x £20—£640 per annum). Motor car mileage expenses paid.

Forms of application (and further particulars) may be obtained from the Secretary, County Education Office, Shire Hall, Gloucester, not later than 30 June, 1955.

GUY H. DAVIS,
Clerk of the County Council.
(T 275)

CENTRAL ELECTRICITY AUTHORITY
North Eastern Division

APPLICATIONS are invited for the appointment of GROUP CHEMIST (North) with Headquarters at Carliol House, Newcastle upon Tyne, 1.

Candidates should possess an Honours Degree or A.R.I.C.: have considerable experience in Power Station chemistry, and a good knowledge of modern analytical and theoretical chemistry.

The successful candidate will be responsible to the Divisional Chemist for the technical direction of all the laboratories in the Northern Group of the Division.

The salary for the appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule "C," Grade 2 (£950/£1,165 per annum) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from Divisional Establishments Officer, Central Electricity Authority, North Eastern Division, Carliol House, Newcastle upon Tyne, 1, to whom they should be returned to arrive not later than 16 July, 1955. (T 274)

CENTRAL ELECTRICITY AUTHORITY
London Division

APPLICATIONS are invited for the following superannuable posts. Conditions of service in accordance with N.J.B. Agreement, Schedule A or C. Salary includes London Allowance. Qualifications entitling to Graduate Membership of the I.E.E. or I.MECH.E. for posts (*a*) and Corporate Membership for post (*b*) an advantage.

(*a*) SHIFT CHARGE ENGINEER,
BARNES GENERATING STATION
Vacancy No. 55/452

Practical experience necessary in efficient operation of Power Station plant. Salary—Class C, Grade 7=£666. 15s. per annum.

(*a*) SHIFT CHARGE ENGINEER,
BECKENHAM GENERATING STATION
Vacancy No. 55/453

Practical experience necessary in efficient operation of Power Station plant. Salary—Class B, Grade 7=£624. 15s. per annum.

(*a*) ASSISTANT ENGINEER (INSTRUMENTS)
FULHAM GENERATING STATION
Vacancy No. 55/454

Applicants should have comprehensive knowledge of the repair and testing of all types of Generating Station instruments. Salary—Class K, Grade 13=£708. 15s. per annum.

(*a*) ASSISTANT ENGINEER (TECHNICAL)
LOMBARD ROAD GENERATING STATION
Vacancy No. 55/455

Applicants should have sound technical training and should be conversant with preparation of routine Operating Returns and preferably some knowledge of instrument maintenance. Salary—Class F, Grade 12=£582. 15s. per annum.

(*a*) ASSISTANT SHIFT CHARGE ENGINEER,
WEST HAM GENERATING STATION
Vacancy No. 55/456

Sound practical and technical training necessary with practical experience in operation of Power Station plant. Salary—Class H, Grade 9=£792. 15s. per annum.

(*b*) SHIFT CHARGE ENGINEER,
WOOLWICH GENERATING STATION
Vacancy No. 55/457

Sound practical and technical training necessary with practical experience in the operation and maintenance of Boilers, Turbines and E.H.T. Switchgear. Salary—Class G, Grade 7=£829. 10s. per annum.

3RD ASSISTANT ENGINEERS (MECHANICAL)
CONSTRUCTIONAL DEPARTMENT,
DIVISIONAL HEADQUARTERS
Vacancy No. 55/458

Applicants seeking technical scope should have experience of plant design and layout of Generating Stations, specification preparation and contract procedure. Some experience of site erection or plant operation would be an advantage. Qualifications leading to Corporate Membership of the Institution of Mechanical Engineers or equivalent. Salary—Class AX/EX, Grade 4=£787. 10s./£1,023. 15s. per annum. (Applicants for Vacancy No. 55/319 will be considered and need not re-apply.)

Applications, quoting vacancy number, may be made on form obtainable from Divisional Secretary, Central Electricity Authority, London Division, P.O. Box 136, Generation House, Gt. Portland St, W.1, and be received within 14 days of this advertisement. (T 292)

NATIONAL COAL BOARD

invite applications for a superannuable appointment as ASSISTANT ENGINEER (Electrical) in the Power Generation Section of Production Engineering Branch at London Headquarters. Applicants should have experience in the layout and installation of switchgear, transformers and cables, and in the preparation of specifications for this equipment. Appointment will be according to qualifications and experience, in the salary range £500/£1,000 per annum, but not less than £650 at age 25.

Write, giving full particulars (in chronological order) of age, education, qualifications and experience (with dates) to National Coal Board, Establishments (Personnel), Hobart House, Grosvenor Place, London, S.W.1, marking envelope SS/15. Original testimonials should *not* be forwarded. Closing date 16 July, 1955. (T 266)

LONDON ELECTRICITY BOARD

VACANCIES—ENGINEERING DRAUGHTSMEN

APPLICATIONS are invited for various vacancies within the Board. These posts are permanent and superannuable and are graded under Schedule D of the National Joint Board Agreement as Grade 6, £535. 10s./£661. 10s. per annum, inclusive of London Allowance.

South Eastern Sub-Area

DESIGN AND PLANNING BRANCH
AT WOOLWICH, S.E.18
Vacancy No. V/1973/T

Applicants should have had a good general and technical education in building construction and architecture, and experience in the design of small buildings in brickwork and reinforced concrete and the drawing up of specifications.

Hampstead/Willesden District

(DESIGN AND PLANNING)
Vacancy No. V/1972/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in mains records office dealing with systems of all voltages up to 11 kV.

North Eastern Sub-Area

(AT STRATFORD, E.15)
Vacancy No. V/1971/T

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: engineering drawings, plant lay-out in substations; layouts and site plans of mains work; electrical diagrams.

St. Marylebone/St. Pancras District

(DESIGN AND PLANNING)
Vacancy No. V/1967/T

Applicants should have had a good general and technical education in electrical engineering and building construction, and experience in mains records office dealing with systems of all voltages up to 11 kV.

Northern Sub-Area

DESIGN AND PLANNING BRANCH
(AT ALDERSGATE ST, E.C.1.)
Vacancy No. V/1965/T

Applicants should preferably have had experience in mains recording with a public utility authority, preferably with an Electricity Board, and be able to obtain particulars on site and compile accurate permanent records. Some knowledge of electrical plant layout, building construction and simple reinforced concrete structures would be an additional advantage.

Western Sub-Area

(AT ECCLESTON PLACE, S.W.1)
Vacancy No. V/1947/T

Candidates must have had a good general and technical education, up to National Certificate standard, and must be neat draughtsmen. They should be conversant with the layout of switchgear and transformers and associated equipment up to 11 kV for small substations. They should also be conversant with electrical diagrams, mains records, and similar work. Those with good experience in surveying and planning of mains networks would be considered even if having little experience of substation layouts.

North Eastern Sub-Area

WEST HAM DISTRICT
Vacancy No. V/1939/T

Candidates should have had a good general and technical education, up to Ordinary National Certificate standard. They should have had considerable experience in transformer chamber layout, mains records and system diagrams. Knowledge of building construction would be an advantage.

South Eastern Sub-Area

(AT WOOLWICH, S.E.18)
Vacancy No. V/1842/T

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: drawing office routine, electrical diagrams, obtaining and recording all mains work and plant layout in transformer chambers.

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Southern Sub-Area

AT BECKENHAM, KENT
Vacancy No. V/1980/T

Candidates should have a good general and technical education up to Ordinary National Certificate standard, be neat and capable draughtsmen, and experienced in one or more of the following subjects: drawing office routine, electrical diagrams, layout of plant in transformer chambers, mains survey and recording of mains work. (T 90)

YORKSHIRE ELECTRICITY BOARD

No. 5 (Wakefield) Sub-Area

SENIOR ASSISTANT (BILLING AND RENTALS)

APPLICANTS should have a thorough knowledge of billing procedure in respect of domestic, commercial and industrial consumers and the maintenance of hire-purchase control. They should be conversant with punched card methods of billing and have experience in the supervision of staff.

The possession of an accountancy qualification will be an advantage.

Salary—N.J.C. Grade 6, £795/£25/£870 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 5 (Wakefield) Sub-Area, Yorkshire Electricity Board, 1a Denby Dale Rd, Wakefield, not later than 7 July, 1955.

No. 4 (Leeds) Sub-Area

Leeds District

FOURTH ASSISTANT DISTRICT ENGINEERS

Applicants should preferably be Graduates of the Institution of Electrical Engineers and have experience in the construction, operation, maintenance and planning of overhead and underground distribution systems in densely populated industrial and residential areas.

The successful applicant must be prepared to reside within the District and undertake standby duties if required.

Salary—N.J.B. Class K, Grade 11, £755/£15/£800 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 4 (Leeds) Sub-Area, Yorkshire Electricity Board, Bramhope, near Leeds, not later than 7 July, 1955.

No. 2 (Huddersfield) Sub-Area

Halifax District

FOURTH ASSISTANT DISTRICT ENGINEER

Applicants should be graduate members of the Institution of Electrical Engineers or possess equivalent qualifications and have had experience in the design, construction, operation and maintenance of H.V. and L.V. Overhead and Underground distribution networks, substation plant and ancillary equipment.

Salary—N.J.B. Class H, Grade 11, £675/£15/£720 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 2 (Huddersfield) Sub-Area, Yorkshire Electricity Board, Market St, Huddersfield, not later than 7 July, 1955.

No. 3 (Sheffield) Sub-Area

ENGINEERING DRAUGHTSMAN

Applicants should be able to prepare, under supervision, final layout building and civil engineering drawings connected with the erection and equipment of Electricity Distribution Substations.

Entry into the grade will be according to capabilities and experience.

Salary—N.J.B. Schedule D, Grade 6, £510/£20/£630 per annum.

Applications, giving full details of age, qualifications and experience, together with the names of two referees, should be forwarded to the Manager, No. 3 (Sheffield) Sub-Area, Yorkshire Electricity Board, Commercial St, Sheffield, not later than 7 July, 1955. (T 283)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

FOURTH ASSISTANT ENGINEER (Buildings) required in the No. 4 Sub-Area of the Board, Electricity House, Rhostyllen, near Wrexham. Salary £675/£720 per annum. (N.J.B. K/13.)

Applicants should have had experience of design and detail drawing of various architectural and civil engineering works, specification writing, estimating, surveying and levelling, and supervision of site work.

The appointment is superannuable and subject to medical examination.

Application forms obtainable from the Manager, above address. Closing date: 4 July, 1955. (T 267)

CENTRAL ELECTRICITY AUTHORITY

East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

SENIOR DRAUGHTSMAN (CIVIL)
CONSTRUCTION DEPARTMENT
Vacancy No. 99/55/ET

Candidates should have experience in the preparation of detail drawings and in the design of one or more of the following subjects:

Reinforced concrete structures.
Piled and slab foundations for heavy components.
Cable subways, Bridges and Culverts.

The Salary will be in accordance with Grade 4 (£750 x £20—£850 per annum) or Grade 5 (£640 x £20—£740 per annum) of Schedule D of the National Joint Board Agreement.

Closing date for receipt of applications, 4 July, 1955.

This appointment will be pensionable within the terms and provisions of the Central Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form A.E.6/ACT which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy number.

L. F. JEFFREY,
Divisional Controller.
(T 284)

THE UNITED KINGDOM ATOMIC ENERGY AUTHORITY

Aldermaston, Berks,

requires ENGINEERS, Grade III, to supervise a small team of technicians in the planning and execution of electrical engineering work associated with home and overseas trials of atomic weapons, involving short tours of overseas duty. The duties will include the provision of dependable A.C. and D.C. stabilised electrical supplies to isolated sites, and the installation, testing, operation and maintenance of such supplies and prime movers throughout the trials period. Applicants should have served a recognised engineering apprenticeship and be corporate members of the Institution of Electrical Engineers, or possess equivalent qualifications. They should have a sound theoretical knowledge and wide practical experience of the distribution of electrical supplies, of generators up to 100 kVA, internal combustion engines, protective gear and lightning and static protection and battery maintenance. A knowledge of electronics would be an advantage.

Salary: £659/£1,065 per annum (male).

Superannuation: The successful applicants will be required to join the Authority's contributory scheme.

Housing: Housing accommodation will be available within a reasonable period for married officers who live outside the radius of the Establishment's transport facilities or alternatively the Authority may be able to assist successful applicants in the purchase of a house. During this period a lodging allowance may be payable.

Requests for application forms by postcard to Senior Recruitment Officer, A.W.R.E., Aldermaston, Berks. Quote reference 676/WGE/49. (T 249)

CENTRAL ELECTRICITY AUTHORITY
East Midlands Division

APPLICATIONS are invited for the following positions within the Division:

SECOND ASSISTANT ENGINEER (MECHANICAL) GENERATION (CONSTRUCTION) DEPARTMENT

Vacancy No. 101/55/ET

Preference will be given to applicants who hold a degree in Mechanical Engineering, are Corporate Members of the Institution of Mechanical Engineers, or possess equivalent qualifications. Some electrical training and experience will be a recommendation.

They should be experienced in the design and construction of turbo-alternators, boilers, coal and ash handling plant, high pressure steam and water piping and other ancillary work.

Experience in the preparation of specifications and estimates and a knowledge of thermo-dynamics and hydraulics will be an advantage.

Salary will be within Class AX/DX, Grade 2 (£950/£1,165 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 11 July, 1955.

THIRD ASSISTANT ENGINEER (MECHANICAL) GENERATION (CONSTRUCTION) DEPARTMENT

Vacancy No. 102/55/ET

Applicants should have had a fundamental training in mechanical engineering, including workshops, and should preferably have had experience in the manufacture, erection, maintenance and operation of mechanical plant as installed in Modern Power Stations. Preference will be given to candidates who possess a university degree or equivalent qualification in Mechanical Engineering.

Salary will be within Class AX/DX, Grade 4 (£750/£950 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 11 July, 1955.

GENERAL ASSISTANT ENGINEER (CHEMIST) STAYTHORPE POWER STATION, NEAR NEWARK

Vacancy No. 100/55/ET

Candidates must have had a sound technical training and some previous laboratory experience and should hold the Ordinary National Certificate in Chemistry (or equivalent qualifications).

Salary will be within Class J, Grade 16 (£515 x £15—£560 per annum) of the National Joint Board Agreement.

Closing date for receipt of applications, 11 July, 1955.

These appointments will be pensionable within the terms and provisions of the Central Electricity Authority and Area Boards Superannuation Scheme.

Applications should be submitted on the official form A.E.6/ACT which may be obtained from the Divisional Establishments Officer, Central Electricity Authority, P.O. Box 25, Barker Gate, Nottingham, and should be returned to the undersigned by the date stated. Please quote Vacancy Number.

L. F. JEFFREY,
Divisional Controller.

17 June, 1955. (T 299)

LONDON ELECTRICITY BOARD

ENGINEER (OPERATION AND MAINTENANCE)

APPLICATIONS are invited for the above position in the Stepney/Bethnal Green District of the Northern Sub-Area.

Applicants should have had a sound technical education up to at least National Certificate standard, preferably being corporate members of the I.E.E., and possess a practical experience of all branches of engineering work associated with the organisation of a District Distribution department, particularly in regard to mains and substations work on D.C. and A.C. systems.

The post is graded under Schedule "A" of the National Joint Board agreement as Class "F," Grade 11—£624. 15s. per annum rising to £672 per annum, inclusive of London Allowance.

Application forms obtainable from Personnel Officer, 46/7 New Broad St, London, E.C.2, to be returned completed by 4 July, 1955. Please enclose addressed envelope and quote ref.: V/1976/T. (T 248)

FEDERAL GOVERNMENT OF NIGERIA

ASSISTANT ELECTRICAL ENGINEER, RAILWAY DEPARTMENT

TO be responsible to the Electrical Engineer for all electrical branches of the Department, viz. Transformer Substation, maintenance and repairs of all electrical equipment in Workshops, House wiring and maintenance, Train Lighting, Wharf Plant, small power stations at outside Depots, and station and yard lighting where provided.

Appointment is either pensionable on probation in the salary range £910/£1,560 per annum gross, or on contract in the range £1,116/£1,898 per annum gross plus a gratuity of £150 per annum payable on satisfactory completion of contract. Free first-class passages for the officer, his wife, and an annual maintenance allowance of up to £75 each is payable in respect of a maximum of two children. Furnished quarters provided if available at low rental. Leave is granted at the rate of 7 days per completed month of resident service.

Candidates, between 30 and 35, should be Associate Members of the Institution of Electrical Engineers, or have passed or be exempt from Parts A and B of the Institution's examination, and have served an apprenticeship with a reputable Electrical Engineering firm. They should have had experience in Workshops and Drawing Office with particular emphasis on installation of H.T. and L.T. Power equipment and distribution systems, and have had some administrative experience.

Apply in writing to the Director of Recruitment, Colonial Office, Great Smith St, London, S.W.1, giving briefly age, qualifications and experience. Mention the reference number (BCD.110/14/030/D10). (T 269)

CENTRAL ELECTRICITY AUTHORITY
Midlands Division

POWER STATION SUPERINTENDENT is required for Hams Hall "C" Power Station. Superannuable appointment, salary in accordance with N.J.M. Scale 3, £1,575/£1,725 per annum.

Candidates should have a wide experience in the operation of a large modern high pressure generating station, and should possess sound administrative ability. The possession of a University degree in engineering or corporate membership of the Institution of Electrical and/or Mechanical Engineers will be an advantage.

Apply, quoting Vacancy No. 975.MD on form AE6, available from the Establishments Officer, 53 Wake Green Rd, Moseley, Birmingham 13, by 9 July, 1955. (T 295)

CENTRAL ELECTRICITY AUTHORITY
South Western Division

TECHNICAL STAFF VACANCIES

(1) ASSISTANT ENGINEER (EFFICIENCY AND TEST), Portishead "B" Power Station. N.J.B. J7, £900/£975.

(2) ASSISTANT ENGINEER (INSTRUMENTS), Portishead "B" Power Station. N.J.B. J10, £755/£800.
(These gradings are subject to confirmation by the District and National Joint Boards.)

(3) GENERAL ASSISTANT ENGINEER (CONTROL), Hayle Power Station. N.J.B. F14, £475/£520. Superannuation.

Applicants for (1) should possess H.N.C., be experienced in operation and investigation of modern Power Station Plant and familiar with use of testing equipment. Large P.F. boiler and auto-combustion control experience, desirable.

For (2) should have experience of modern Power Station Plant, with sound technical training and good practical knowledge of construction, repair and testing of instruments and automatic controls.

For (3) should possess O.N.C. in Electrical or Mechanical Engineering or equivalent. Previous power station experience an advantage.

Application forms obtainable from Divisional Secretary, 26 Oakfield Rd, Bristol 8, to be completed and returned by 2 July, 1955. (T 293)

BOROUGH OF MANSFIELD
Water Department

APPLICATIONS are invited for the following appointment on the permanent staff of the Borough Water Engineer and Manager:

ASSISTANT PUMPING STATIONS SUPERINTENDENT and ELECTRICAL MAINTENANCE ENGINEER, salary to be fixed according to qualifications and experience, within Grade IV of the Miscellaneous Division of the National Joint Council's Scale of Salaries (£485/£545 per annum).

Applicants must be fully qualified electricians and capable of carrying out repairs and maintenance work on all electrical plant and equipment normally found in a Waterworks Pumping Station. Preference will be given to candidates holding a National Certificate in Electrical Engineering, or other equivalent qualification.

The appointment will be subject to the provisions of the Local Government Superannuation Acts, and to the passing of a medical examination.

Application form, and details of the appointment, can be obtained from the Water Engineer and Manager, Exchange Row, Mansfield, Notts.

Applications should be delivered to the Water Engineer and Manager, Exchange Row, Mansfield, not later than Saturday, 9 July, 1955.

Housing accommodation will be available for the successful applicant.

A. C. SHEPHERD,
Town Clerk.

Carr Bank,
Mansfield.
18 June, 1955. (T 319)

ATOMIC ENERGY RESEARCH ESTABLISHMENT
Harwell

has vacancies for DEVELOPMENT ENGINEERS in its Instrument Department for interesting work on instruments for Atomic Energy uses, mainly concerned with Industrial Process and electronic application.

Qualifications. Corporate membership of the Institution of Mechanical or Electrical Engineers or an Honours degree in Engineering, or exempting qualifications. Applicants should preferably have served a recognised engineering apprenticeship. Previous design or development experience in Instruments Process Control is desirable although applicants with experience of development work in other instrument engineering fields will be considered.

Salary. The posts are graded Engineer III and salary scale is £695 (at age 25)—£1,065 per annum. Successful candidates will be required to join the Authority's contributory superannuation scheme.

Housing. A house will be available within a reasonable period of time for the selected officer if he is married and lives outside the radius of the Establishment's transport facilities.

Requests for Application Form should be sent on a postcard to Establishments Officer, U.K. Atomic Energy Authority, A.E.R.E., Harwell, Didcot, Berks, quoting 2/103/277. (T 320)

CENTRAL ELECTRICITY AUTHORITY
South Eastern Division

FOURTH ASSISTANT ENGINEER to act as Instructor at the Training Centre at Brighton which comprises workshops, lecture rooms, etc. Candidates must have served a recognised workshop apprenticeship and have experience of instructing in the use of hand and machine tools, fitting and turning, methods of heat treatment, elementary electrical practice, etc. The duties will include the supervision and instruction of craft and student apprentices and graduate trainees in basic workshop practice, the necessary demonstrating, lecturing and general clerical work in connection with the Centre. N.J.B. conditions of service, Class AX/DX, Grade 6, £600/£785 per annum. Applications, giving details of education, present position, experience, etc., should be received by the Establishments Officer, Central Electricity House, Lower Ham Rd, Kingston-upon-Thames, Surrey, to arrive by 4 July, 1955. (T 288)

THE NORTH WESTERN ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER, TECHNICAL AND RESEARCH SECTION, CHIEF ENGINEER'S DEPARTMENT, AREA BOARD HEADQUARTERS, MANCHESTER

DUTIES will include a study of the problems arising on a large distribution system. A wide experience of distribution methods is desirable, together with a good knowledge of protective gear. Ability to prepare concise reports will be an advantage.

Technical qualifications should be up to H.N.C. standard in Electrical Engineering.

Salary Scale: £750/£975 per annum. Commencing salary according to qualifications and experience. Class AX/EX, Grade 4, N.J.B. Conditions.

NOTE.—Applicants who applied in response to the previous advertisement of this post need not re-apply.

Applications to Establishment Officer, The North Western Electricity Board, Cheetwood Rd, Manchester 8, by 2 July, 1955.

SECOND ASSISTANT DISTRICT ENGINEER, WEST DISTRICT, STRETFORD

The duties will include the supervision of the erection and maintenance of substation switchgear, laying and jointing of cables, and switching operations on the H.V. and L.V. systems within the District as required. Corporate Membership of the Institution of Electrical Engineers will be an advantage.

Salary Scale: £755 x £15—£800 per annum, Grade F.7, N.J.B. Conditions.

FOURTH ASSISTANT ENGINEER (ASSISTANT CHARGE ENGINEER) SUB-AREA MAINS ENGINEER'S DEPARTMENT, MANCHESTER

The duties will include assisting the Charge Engineer in carrying out the operational control of a large E.H.V. transmission and distribution system, involving the use of supervisory control and system switching. The system interconnects a number of Power Stations. Applicants must be prepared to perform shift duties. Preference given to applicants who hold the H.N.C. in Electrical Engineering.

Salary Scale: £715 x £15—£760 per annum, Grade L.13, N.J.B. Conditions.

GENERAL ASSISTANT ENGINEERS
(*a*) OPERATION SECTION (SUB-AREA CONTROL), MANCHESTER
(*b*) SUB-AREA MAINS ENGINEER'S DEPARTMENT, MANCHESTER

Applicants should possess the H.N.C. in Electrical Engineering or an equivalent qualification, and should have had a basic works training of not less than two years. Consideration will also be given to applicants in possession of the O.N.C. who are progressing towards obtaining their H.N.C.

Post (*a*) The duties will be on a shift basis, and applicants will be required to assist with the carrying out of switching duties on a large E.H.V. and L.V. transmission and distribution system, including supervisory control.

Post (*b*) Successful candidates will be required to work in Manchester and surrounding districts and will be given the opportunity to gain experience in various sections of the Mains Engineer's Department.

Salary Scale (both posts): £475 x £15—£520 per annum, Grade L.19, N.J.B. Conditions.

Applications for the above posts to the Sub-Area Secretary, No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester, P.O. Box 493, by 2 July, 1955.

GENERAL ASSISTANT DISTRICT COMMERCIAL ENGINEER, KENDAL DISTRICT

The successful applicant will be required to assist in the preparation of estimates and the supervision of Contract work for Commercial, Industrial and Street Lighting schemes. Experience in agricultural applications of electricity would be an advantage. Preference given to applicants who hold the H.N.C. in Electrical Engineering.

Salary Scale: £475 x £15—£520 per annum, Grade D.12, N.J.B. Conditions.

Applications to Sub-Area Manager, No. 6 Sub-Area, The North Western Electricity Board, Castle Green, Kendal, by 2 July, 1955. (T 303)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

EASTERN ELECTRICITY BOARD

APPLICATIONS are invited for the following appointments in the Northmet Sub-Area. The successful candidates will be required to contribute to a superannuation scheme and may be required to undergo a medical examination.

Enfield District

SENIOR SALES REPRESENTATIVE
115/55.R

Candidates must be of good address and have had sound practical training with experience in electrical installation work for domestic and commercial premises. A good knowledge of electric water heating and ability to prepare wiring specifications and estimates is essential.

Salary—N.J.C. Grade 2 (£525/£585) plus London Weighting.

GENERAL ASSISTANT ENGINEERS

Candidates should have had a good general and technical education and should possess the Higher National Certificate in electrical engineering or an equivalent qualification.

Salary—N.J.B. Class F, Grade 13 (£515/£560) plus London Weighting.

Apply for both positions by letter, within 14 days, to the District Manager, Eastern Electricity Board, 40 Church St, Enfield, Middlesex.

Wood Green and Stevenage Districts

FOURTH ASSISTANT ENGINEERS
113 and 116/55.R

Candidates should have had a sound technical training and experience in the construction, operation and maintenance of H.V. and L.V. distribution systems including substations.

Salary—N.J.B. Class F, Grade 11 (£595/£640) plus London Weighting for the vacancy in Wood Green District.

Apply by letter within 14 days to the appropriate District Manager, Eastern Electricity Board, at the following addresses:
(i) 13/27 Station Rd, Wood Green, London, N.22.
(ii) 38 High St, Stevenage, Herts. (T 315)

CENTRAL ELECTRICITY AUTHORITY
North Eastern Division

APPLICATIONS are invited for the appointment of THIRD ASSISTANT ENGINEER (Calculations and Investigations), Technical Department, Newcastle upon Tyne, 1.

Candidates should have technical qualifications of at least Graduate I.E.E. standard and experience connected with a large interconnected power system.

The Engineer appointed will be required to carry out system fault and load flow calculations, and assist in planning and the preparation of reports. Experience in similar work is very desirable.

The salary for this appointment (which is superannuable) will be in accordance with the National Joint Board Agreement, Schedule C, Grade 4 (£750/£950 per annum) and will commence at a point commensurate with qualifications and experience.

Forms of application may be obtained from Divisional Establishments Officer, Central Electricity Authority, North Eastern Division, Carliol House, Newcastle upon Tyne, 1, to whom they should be returned to arrive not later than 9 July, 1955. (T 298)

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the post of ASSISTANT ENGINEER in the Transmission Section of the Chief Engineer's Department at Glasgow.

Applicants should have the minimum qualification of a Higher National Certificate in Electrical Engineering and also experience in the Electricity Supply Industry and/or with a firm of electrical manufacturers.

Salary will be in accordance with N.J.B. Schedule "C." Class AX/DX, Grade 6, £600/£785 per annum.

The position is superannuable. Application should be made on the standard application form which may be obtained from the undersigned, and returned not later than 9 July, 1955.

J. MEEK,
Secretary.

P.O. Box 173
351 Sauchiehall St, Glasgow, C.2.
18 June, 1955. (T 296)

CENTRAL ELECTRICITY AUTHORITY

SENIOR CIVIL ENGINEER, CHIEF ENGINEER'S DEPARTMENT HEADQUARTERS

APPLICATIONS are invited for the appointment of a Senior Civil Engineer in the Chief Engineer's Department at Headquarters in London.

The salary for the appointment, which is superannuable will be within the range £2,400/£2,900 per annum.

Candidates should be corporate members of the Institution of Civil Engineers and have wide experience in the design and construction of large civil engineering works, preferably associated with thermal generating stations and hydro-electric projects.

Duties will include the critical examination of civil engineering problems involved in the construction of new and extension of existing generating stations.

Applications, stating age, qualifications, experience, present position and salary to be forwarded to D. Moffat, Director of Establishments, Winsley St, W.1, to be received not later than 8 July, 1955. Quote AE/610. (T 285)

LONDON ELECTRICITY BOARD

VACANCIES—SENIOR DRAUGHTSMEN

APPLICATIONS are invited for the following vacancies. These posts are permanent and superannuable and are graded under Schedule D of the National Joint Board agreement as Grade 5—£672/£777 per annum inclusive of London Allowance.

Western Sub-Area

(at Eccleston Place, S.W.1)
Vacancy No. V/1966/T

Candidates must have had a sound general education with technical qualifications equivalent to the Higher National Certificate in electrical engineering. They should have had some workshop training and mechanical experience, and must be conversant with the layout of switchgear and plant up to 11 kV for small substations, including preparation of associated electrical diagrams. A knowledge of building and R.C. structures, whilst not essential, would be an advantage.

Southern Sub-Area

(at Beckenham, Kent)
Vacancy No. V/1979/T

Candidates should have had a good general and technical education and be experienced in one or more of the following subjects: building and civil engineering design, engineering drawing, plant layout in substations. In addition the applicant should be capable of supervising Engineering Draughtsmen and/or Junior Draughtsmen, if required.

Application forms for both the foregoing vacancies are obtainable from the Personnel Officer, 46/7 New Broad St, London, E.C.2. Please enclose addressed envelope and quote reference No. of vacancy preferred. (T 226)

A FIRM engaged in the Installation and Electric Motor Repair industry requires a TECHNICAL REPRESENTATIVE with sound theoretical and practical knowledge. Applications giving detailed particulars to The Midland Electric Installation Co., Ltd., Cyprus Works, Upper Villiers St, Wolverhampton. (T 306)

A SKILLED ARMATURE WINDER/FITTER for assembly of wide range of electric motors, etc. Must have repair shop experience. Excellent prospects. Lewis Electric Motors Ltd., Moor Works, Maidenhead, Berks. (T 188)

APPLICATIONS are invited for a post as LABORATORY DEMONSTRATOR in the School of Electronics. A technical qualification equivalent to a Higher National Certificate or Diploma, together with good knowledge of electronics, is essential. The successful candidates will be required to assist with Laboratory instruction to students, and generally supervise the maintenance and development of the laboratory equipment. Please write for application form giving details of age, experience and qualifications to: Personnel Manager, Automatic Telephone and Electric Co., Ltd., Strowger Works, Liverpool 7. (T 294)

BELGIAN CONSULTING ENGINEERS

INVITE APPLICATIONS FOR VACANCIES IN THEIR BRUSSELS AND BAGHDAD OFFICES FOR

TWO QUALIFIED ENGINEERS

For BRUSSELS office: one electrical engineer for planning and design of transmission lines and distribution stations including drawing up of specifications and contract documents.

For BAGHDAD office: one electrical engineer, preferably also with mechanical engineering qualifications; duties as for Brussels, but will also be engaged in construction of steam power stations.

QUALIFICATIONS: University degree or equivalent and/or membership of professional institution coupled with practical experience.

For both posts a knowledge of the appropriate British Standards is required. Perfect knowledge of English language essential, knowledge of French desirable. Appointments will be, in the first instance, for 3 years with possibility of extension.

Applications, giving full details of qualifications and experience, should be addressed to the:

Société de Traction et d'Electricité,
31 rue de la Science, Brussels, Belgium.

(T 277p)

ASSISTANT ENGINEER required for Power Company distribution department in Malaya. Age 25-30. Grad. I.E.E. or H.N.C., with recognised electrical apprenticeship. Experience should cover L.T. Distribution and Maintenance with some knowledge of small diesel generating sets. Salary £980/£56/£1,316 per annum, plus cost of living allowance, free passage, quarters and medical attention. Pension Scheme. Write Box E.T.603, c/o 191 Gresham House, E.C.2. (T 251)

A DESIGN ENGINEER is required by a Company in Cardiff manufacturing electrically-rotated machinery, 1-100 h.p. Applicants should possess minimum qualifications of Higher National Certificate, and possess some experience in similar capacity. An attractive commencing salary will be paid and the successful candidate will become a member of an enthusiastic design team. Applications in strictest confidence to Personnel Officer, Brush Electrical Engineering Co., Ltd., Hopkinson Works, Birchgrove, Cardiff. (T 254)

AN ASSISTANT DEVELOPMENT ENGINEER is required by a Company in Cardiff manufacturing cartridge fuse-links. Applicants must possess O.N.C. as a minimum qualification and have experience in a similar capacity. An attractive commencing salary will be paid. Applications in strictest confidence to Personnel Officer, Hopkinson Electric Co., Birchgrove, Cardiff. (T 253)

ASSISTANT to Export Manager, age 30/40, required by manufacturers of specialist electrical control gear with works 20 miles west of London. Higher National Certificate or equivalent. Ability to handle technical and commercial correspondence and small staff. Good prospects and pension scheme. Commencing salary £850 per annum.—Box No. 4597, Electrical Times. (T 193)

SALES MANAGER

FRACTIONAL HORSEPOWER MOTORS

Crompton Parkinson Ltd. would be interested to receive applications for an appointment as Sales Manager for Fractional Motors. This is an important managerial post requiring a knowledge of the market for, and capabilities of, Fractional Motors and preferably experience in Sales Management functions of market research, forecasting and planning for large scale quantity production of high quality machines.

Applications with full particulars of experience and qualifications should be sent to Ref.: MD/P, Crompton House, Aldwych, W.C.2. (T 307p)

BRITISH PETROLEUM CHEMICALS LTD., Grangemouth, invite applications for the post of ELECTRICAL ENGINEER. Candidates should be in the age group, A.M.I.E.E., works trained with experience in the installation, maintenance and construction of switchgear, distribution networks, transformers, electric motors, lighting installations, etc., associated with industrial installations operating at 3·3 kV and 440 V with a demand of some 10,000 kW. The post is progressive in a growing organisation. Rented accommodation can be made available and a non-contributory Pension Scheme is in operation. Commencing salary will be dependent on background and age. Replies to B.P.C. Bo'ness Rd, Grangemouth. (T 187)

CAPABLE ESTIMATOR required by leading cable manufacturers. Good opportunity for a young man with some basic cable knowledge, full training will be given to suitable applicant. The Company have an excellent Pension Scheme, full sickness and accidents benefits and social and athletic club amenities. Expenses paid to applicants selected for interview. Write —Box No. 4611, Electrical Times. (T 282)

CONNOLLYS (BLACKLEY) LIMITED require two additional REPRESENTATIVES for their Cable Division to call on Electricity Authorities, Contractors, Wholesalers, etc.

(*a*) MIDLANDS AREA—territory embracing the Midlands and East Midlands Electricity Boards.
(*b*) SOUTHERN AREA—territory embracing L.E.B., S.E.E.B., S.E.B. and Eastern Electricity Boards.

Car provided, superannuation scheme in operation. Applications giving full particulars and salary required will be treated in strictest confidence and should be addressed to the Sales Manager, Connollys (Blackley) Limited, Manchester 9, and marked "Confidential." (T 309)

DESIGNER required with experience, particularly of small mechanisms. Electrical qualifications desirable, excellent prospects. Applications in confidence stating experience, age and salary required, to Managing Director, Wandsworth Electrical Manufacturing Co., Ltd., Albert Drive, Sheerwater, Woking, Surrey. (T 148)

ELECTRICAL MAINTENANCE ENGINEER wanted by large industrial concern in British East Africa. Should have served a recognised apprenticeship, must be able to take responsibility for maintenance and installation of new equipment. Preference given to men in the age group 23/30 years. Four year tour with four months paid leave. Free passages. Superannuation and medical benefits. Salary commensurate with experience and qualifications. Write Box JN/85., c/o 95 Bishopsgate, E.C.2. (T 271)

DRAUGHTSMAN, ELECTRICAL ENGINEERING, aged 25-35, required by Leading Oil Company for work at their Head Office in London with possibly periods of duty at refineries in U.K. or at overseas stations. Candidates should have the Ordinary National Certificate in Electrical Engineering or have equivalent qualifications. An engineering apprenticeship is required which includes 3 years practical experience in the shops followed by 2-4 years in the Drawing Office on electrical installations for process plants, workshops and/or factories. Non-contributory pension scheme. Luncheon Club. Salary according to age and experience. Write, stating age and full details quoting H.3286 to Box 7764, c/o 191 Gresham House, E.C.2. (T 270)

DRAUGHTSMEN required Electro-Mechanical work of varied nature, knowledge of circuitry an advantage but not essential. Salary in accordance with age and experience, Pension Scheme. Write giving details of experience, etc. (Quoting Ref/STK9) .The General Electric Co., Ltd., Union Works, East Lane, Wembley. (T 317)

ELECTRICAL ENGINEER—Large Oil Company requires young qualified bachelor for service in Middle East. Substantial basic salary with allowances, pensionable service, good prospects, paid home leave. Write quoting No. 526 to Box No. 8838, c/o Charles Barker and Sons Ltd., 31 Budge Row, London, E.C.4. (T 278)

ELECTRICAL BUYER required for London office of Merchant Company operating in Africa and the Middle East. Must be familiar with installation materials and equipment, and have had experience with electrical contractor or wholesaler. Some technical knowledge and experience with radio and domestic appliances would be an added advantage. Commencing salary £800. Reply to Box No. 8831, c/o Charles Barker and Sons Ltd., 31 Budge Row, London, E.C.4, giving age, present salary, qualifications and brief summary of experience. (T 279)

ELECTRICAL ENGINEERING DRAUGHTSMEN required by a firm of Engineers and Contractors on Tees-side for complete electrical installation, design, including motor application, control scheme engineering, distribution and cabling. Experience of contract work and estimating an advantage. Apply stating age, experience and salary required, quoting reference "W." to —Box No. 4609, Electrical Times. (T 281)

EXPERIENCED AIRCRAFT ELECTRICIANS required immediately. Good rates of pay. Single hostel accommodation available. Apply to: Personnel Manager, Skyways Ltd., Stanstead Airport, Essex, quoting P.4. (T 250)

ENGINEER with electrical or physicist degree required for development work on testing equipment for telecommunication cables. Permanent and pensionable position at salary commensurate with experience and qualifications. Please apply giving full particulars to Personnel Officer, Southern United Telephone Cables Ltd., Dagenham Dock, Essex. (T 190)

FOR SINGAPORE CABLE INSTALLATION STAFF

(*a*) ASSISTANT CONTRACT ENGINEER to supervise cable installation contracts.
(*b*) FOREMAN/JOINTER for cabling up to and including 22 kV cables.

The above staff are required for work in Singapore and Malaya. Engagement on a 3 year agreement. Salary according to qualifications and experience. Bachelor quarters provided free.

Applicants should be unmarried and please apply giving full details to:

Box No. 4581, Electrical Times.

(T 152p)

English Electric at Stafford

ELECTRICAL ENGINEERS FOR ROLLING MILL SECTION

METAL INDUSTRIES DIVISION

Vacancies exist in the Engineering and Control Gear Sections for a number of young electrical engineers of either B.SC. or H.N.C. standard who have served a recognised apprenticeship, preferably in a manufacturing industry. Previous experience, either manufacturing or operating, of steelworks or industrial machines and associated control gear would be an advantage.

These are attractive positions for young men who have completed their National Service and wish to continue their career on interesting work in an expanding section of the Company's activities, concerned with all sizes and types of Rolling Mill drives and associated plant.

Good salaries are offered to the successful applicants, and the positions are permanent, progressive and pensionable. Please reply giving full personal particulars, and quoting Ref. 769F, to Dept. C.P.S., 336/7 Strand, W.C.2. (T 210p)

ELECTRICAL ENGINEERS are required by the British Standards Institution for work in connection with the approval of all types of electrical equipment for export to Canada. Applicants should have served an apprenticeship and have technical qualifications equivalent to graduate membership of I.E.E., preference will be given to corporate members.

The positions are pensionable and the salary will be in accordance with qualifications and experience. Apply Establishment Officer, British Standards Institution, 2 Park St, London, W.1. (T 255)

ESTIMATING ENGINEER, for Industrial Electric Control Gear. Interesting work on Automation and related schemes. Good salary and bonus. Reply stating experience, age and qualifications to The Donovan Electrical Co., Ltd., Northcote Rd, Stechford, Birmingham (Nr. Outer Circle bus route). (T 221)

ELECTRICAL DRAUGHTSMAN, junior, age 22-24 years, preferable with O.N.C. and some drawing office experience, required for consultants' office. Excellent opportunity for young man to obtain experience in all branches of electrical engineering. For application form send P.C. to Sir Bruce White, Wolfe Barry and Partners, 1 Lygon Place, London, S.W.1, or telephone SLOane 0431. (T 321)

FOREMAN LINESMAN required for Wood Pole Distribution Scheme in Inverness Area. High Rates paid. Good Conditions. Apply by letter to B. French Ltd., Pike Mills, Green St, Kidderminster. (T 146)

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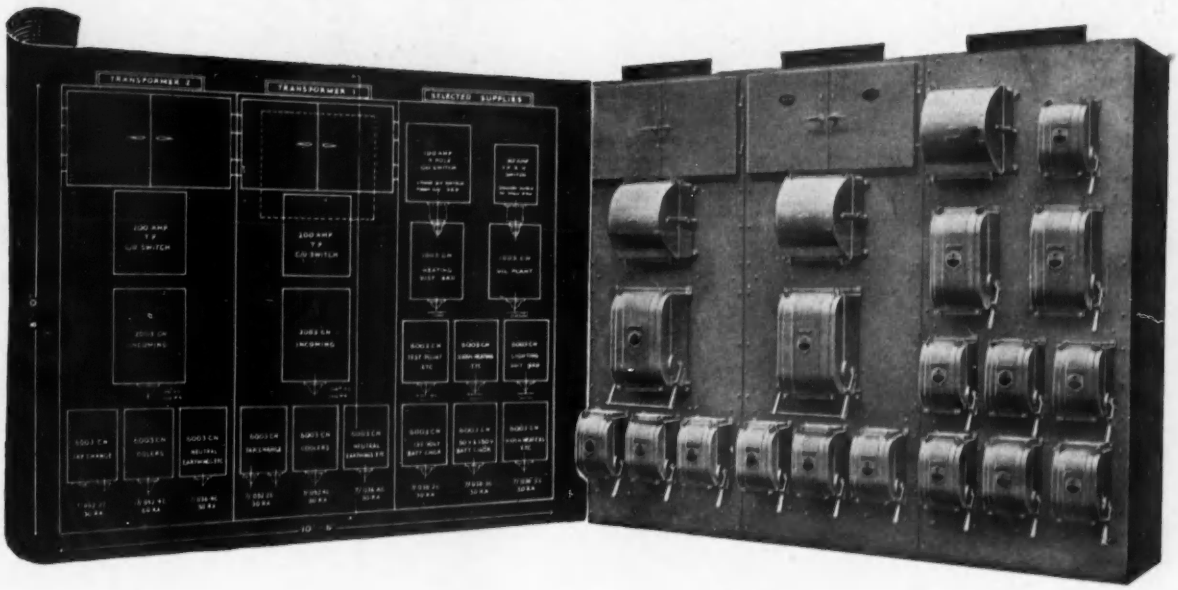

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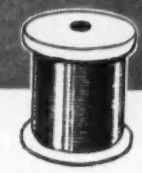

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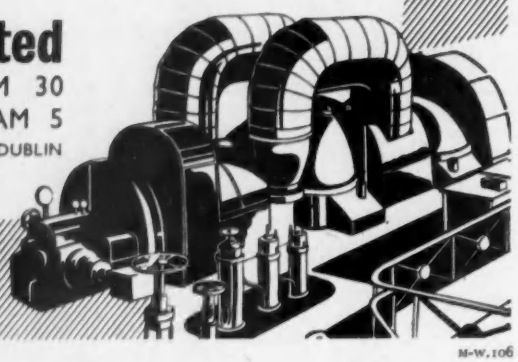

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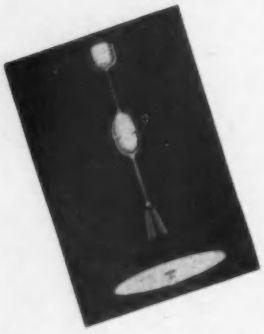

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250V.	100mA.	250V	—	0—20MΩ — using internal batteries.
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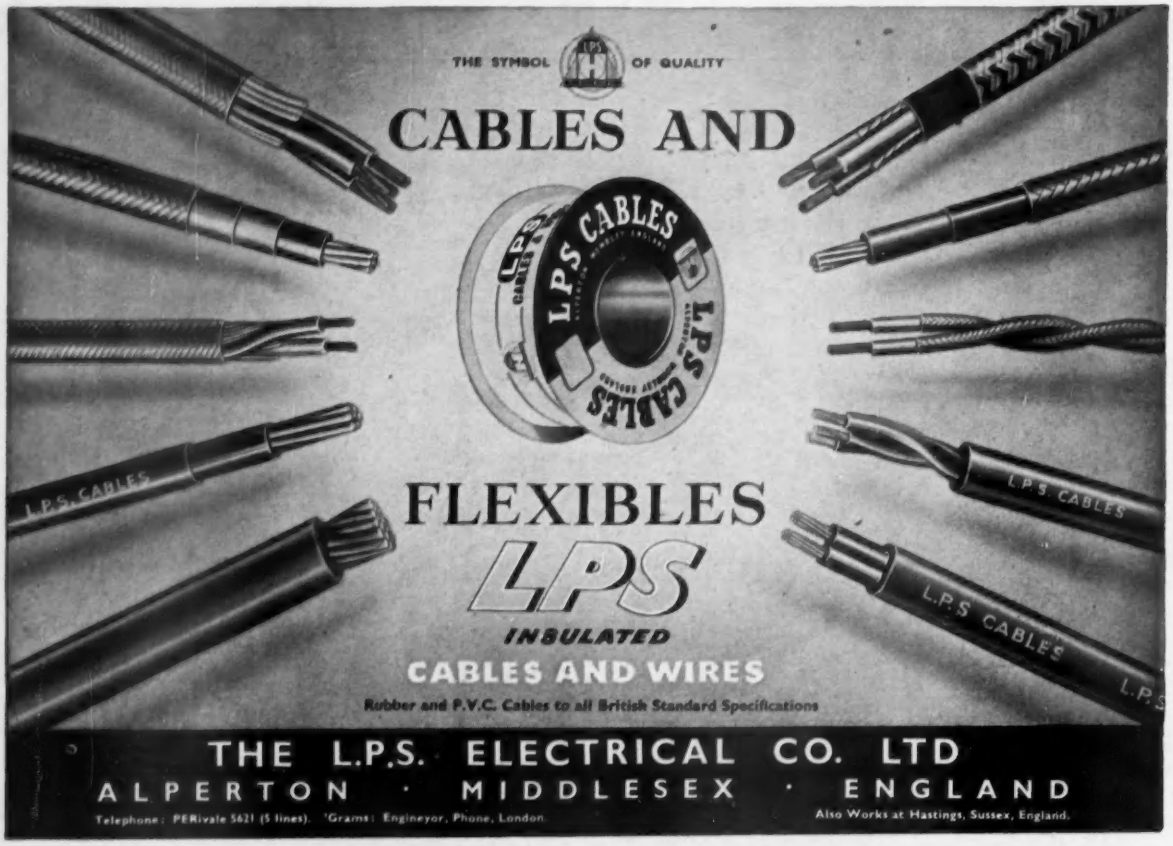

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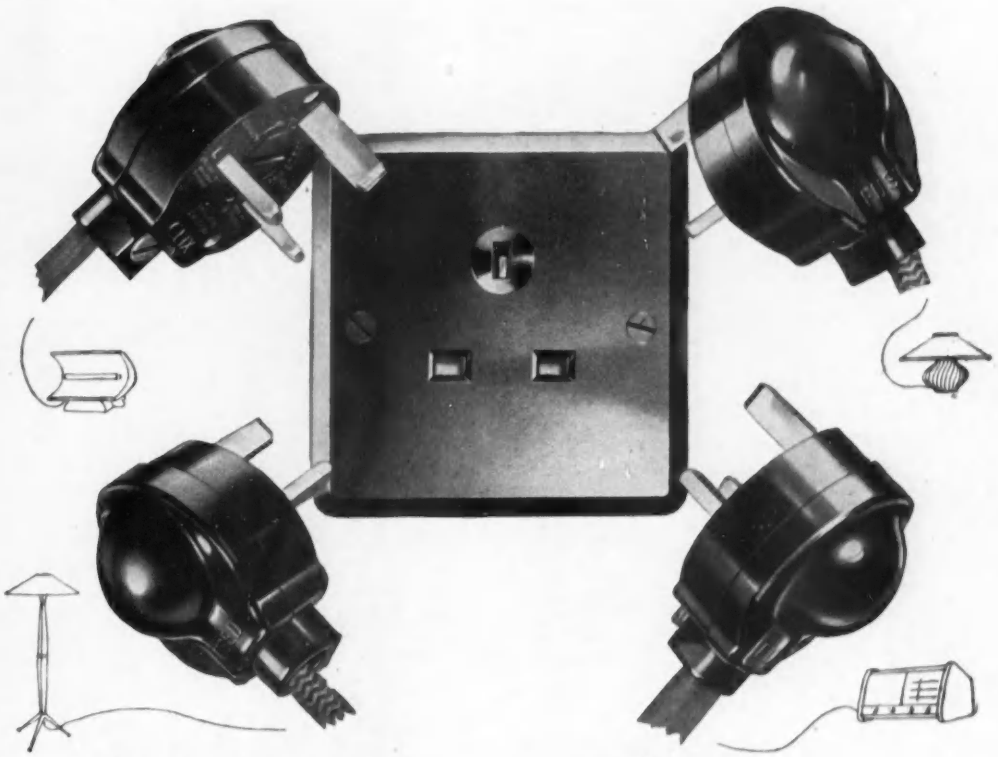

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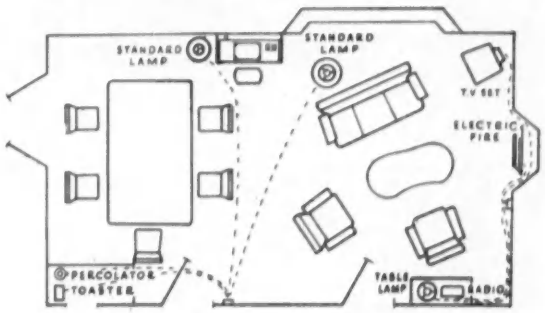
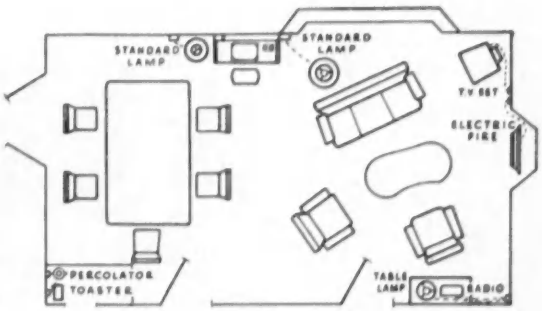


Insufficient socket outlets wrongly placed. Note the long trailing flexibles running dangerously across doorways and "traffic ways".



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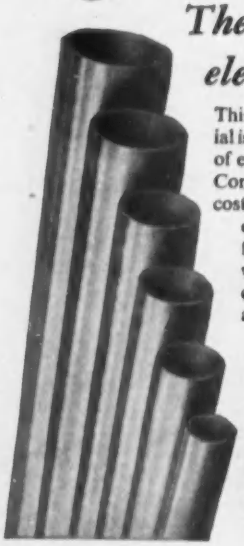

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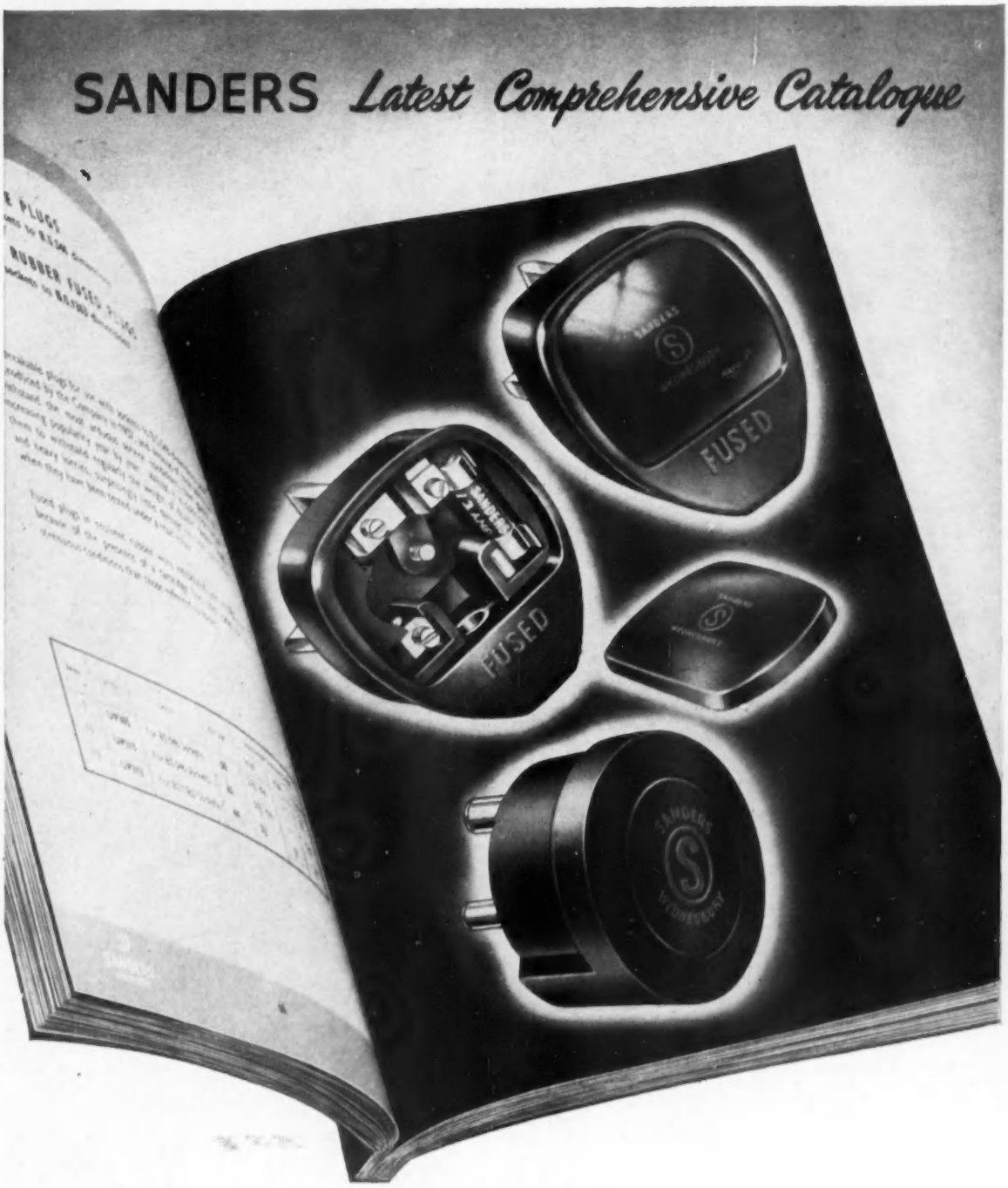

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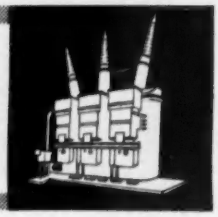

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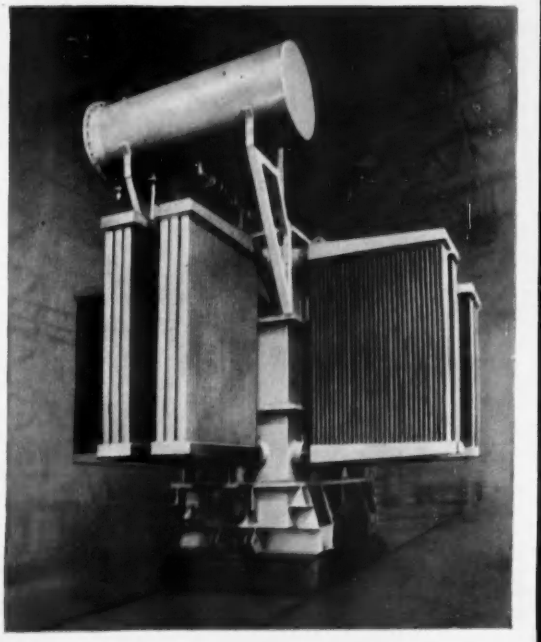

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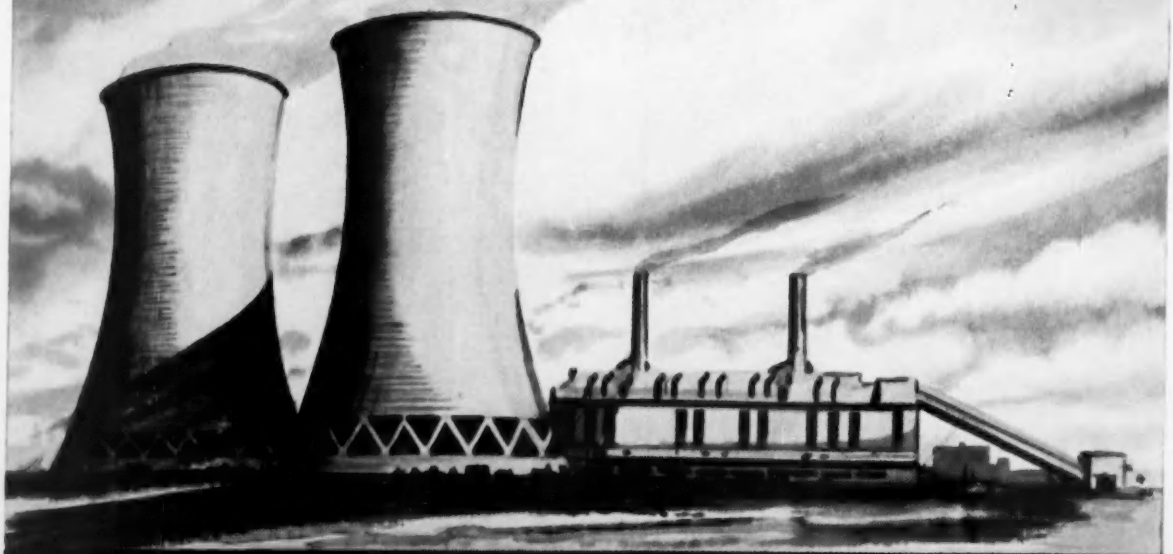

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